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INNOVATION MANAGEMENT IN SMALL AND MEDIUM ENTERPRISES: A COMPREHENSIVE ANALYSIS OF DETERMINANTS, CHALLENGES, AND STRATEGIC IMPERATIVES

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Abstract

Small and Medium Enterprises constitute the backbone of global economies, contributing significantly to employment, GDP growth, and regional development. However, their capacity to innovate remains constrained by unique structural, financial, and operational challenges

that distinguishes them from larger corporations. This paper provides a comprehensive analysis of innovation management in SMEs, synthesizing contemporary literature from 2020 to 2025 to identify the key determinants, barriers, and enablers of successful innovation. The study employs a systematic review methodology, examining peer-reviewed articles that explore the multifaceted nature of SME innovation. The findings reveal that innovation capability in SMEs is determined by six interconnected factors: knowledge and learning capabilities, organizational structure and culture, innovation management and strategy, external networks and collaborations, market orientation and customer insights, and technology and digitalization. Additionally, the paper examines the emerging challenges posed by Industry 5.0 transitions, the role of government funding mechanisms, and the imperative of innovation ambidexterity in resource-constrained environments. The analysis demonstrates that successful innovation management requires a holistic approach that integrates internal capabilities with external partnerships, while also addressing the unique contextual factors that shape SME operations across different regions and sectors. The paper concludes with strategic recommendations for SME managers, policymakers, and researchers, emphasizing the need for targeted support mechanisms, capability-building initiatives, and collaborative innovation ecosystems. Future research directions include longitudinal studies examining innovation trajectories, cross-cultural comparative analyses, and investigations into the integration of sustainability and digitalization imperatives.

Keywords: SME innovation, innovation management, digital transformation, innovation capability, opens innovation

Introduction

Small and Medium Enterprises represent the predominant form of business organization across both developed and developing economies, constituting over 90% of all businesses and employing approximately 60-70% of the global workforce. Their collective contribution to economic development, innovation generation, and employment creation is well-documented, yet the mechanisms through which these enterprises manage innovation remain inadequately understood. Unlike large corporations with dedicated research and development departments, substantial financial resources, and established innovation processes, SMEs must navigate innovation within the constraints of limited resources, informal structures, and heightened vulnerability to market fluctuations (Tsakalerou et al., 2025).

The contemporary business environment presents both opportunities and challenges for SME innovation. The rapid acceleration of digital technologies, the emergence of Industry 4.0 and subsequently Industry 5.0 paradigms, and the increasing emphasis on sustainability have fundamentally altered the innovation landscape. Simultaneously, global disruptions including the COVID-19 pandemic, supply chain volatility, and geopolitical uncertainties have exposed the vulnerabilities of SMEs while also demonstrating their remarkable adaptability and resilience. In this context, understanding how SMEs can

effectively manage innovation has become not merely an academic pursuit but a practical imperative for economic development and societal well-being.

Innovation management in SMEs differs fundamentally from innovation in large enterprises. The resource constraints that characterize SMEs necessitate different approaches to innovation, often emphasizing flexibility, adaptability, and external collaboration over formalized research and development processes. SMEs typically exhibit flatter organizational structures, closer customer relationships, and greater entrepreneurial orientation, all of which can facilitate innovation. However, they also face significant barriers including limited access to finance, difficulties in attracting and retaining skilled personnel, challenges in protecting intellectual property, and vulnerability to environmental turbulence (Rosly et al., 2025).

The literature on SME innovation has expanded considerably in recent years, reflecting growing recognition of the importance of these enterprises in national innovation systems. However, this body of knowledge remains fragmented across disciplinary boundaries and geographical contexts. Systematic reviews have identified persistent gaps in understanding the determinants of innovation capability, the mechanisms through which SMEs can achieve innovation ambidexterity, and the role of external support mechanisms in facilitating innovation outcomes (Tsakalerou et al., 2025). Furthermore, the rapid technological transformations of the past five years have

rendered some earlier findings obsolete, necessitating updated syntheses that reflect contemporary realities.

This paper addresses these gaps by providing a comprehensive analysis of innovation management in SMEs, synthesizing findings from recent empirical studies published between 2020 and 2025. The paper is structured as follows: following this introduction, Section 2 presents a systematic review of the literature organized under thematic subheadings examining determinants of innovation capability, the impact of digital transformation, innovation ambidexterity, the role of external networks and open innovation, government funding and policy support, and challenges in the Industry 5.0 era. Section 3 describes the methodology employed in this study. Section 4 presents the results and discussion of findings, organized around key themes emerging from the analysis. Section 5 concludes the paper with implications for theory and practice, recommendations for stakeholders, and directions for future research.

Literature Review

Determinants of Innovation Capability in SMEs

The innovation capability of SMEs, defined as the ability to continuously transform knowledge and ideas into new products, processes, and systems for the benefit of the firm and its stakeholders, has emerged as a central concern in contemporary entrepreneurship and innovation research. Tsakalerou et al. (2025), in their comprehensive systematic review and bibliometric analysis of 122 empirical studies published between 2020 and 2024,

identified six major determinants of innovation capability in SMEs. These determinants, ranked by their correlation strength with innovation outcomes, include Knowledge and Learning Capabilities, Organizational Structure and Culture, Innovation Management and Strategy, External Networks and Collaborations, Market Orientation and Customer Insights, and Technology and Digitalization.

Knowledge and Learning Capabilities emerged as the most powerful determinant, with a correlation coefficient of 0.98, suggesting that the ability to acquire, assimilate, transform, and exploit knowledge is fundamental to SME innovation success. This finding aligns with absorptive capacity theory, which posits that the firm's ability to recognize the value of new external information, assimilate it, and apply it to commercial ends is critical for innovation performance. For SMEs, which typically lack the internal knowledge generation capacity of larger firms, the ability to learn from external sources including customers, suppliers, competitors, and research institutions becomes particularly crucial.

Organizational Structure and Culture, with a correlation coefficient of 0.96, represents the second most significant determinant. SMEs typically exhibit flatter organizational structures, fewer bureaucratic barriers, and greater flexibility than large corporations, characteristics that can facilitate rapid decision-making and experimentation. However, these same characteristics may also result in informal processes that hinder systematic innovation management. The culture of the organization, including its openness to new ideas, tolerance for failure, and encouragement of employee initiative, shapes the

innovation climate and influences whether employees at all levels contribute to innovation efforts.

Innovation Management and Strategy, with a correlation of 0.81, encompasses the formal and informal processes through which SMEs plan, implement, and evaluate innovation activities. This includes the articulation of innovation goals, the allocation of resources to innovation initiatives, the establishment of processes for idea generation and selection, and the mechanisms for monitoring and evaluating innovation outcomes. While large firms often have dedicated innovation management systems, SMEs must develop approaches that are appropriate to their scale and resources while maintaining sufficient rigor to ensure effective innovation outcomes.

External Networks and Collaborations, correlated at 0.70, reflect the recognition that innovation increasingly occurs within ecosystems rather than within individual firms. For SMEs, which may lack internal capabilities across all relevant domains, collaboration with external partners provides access to complementary knowledge, resources, and markets. These collaborations may take various forms including formal research partnerships, participation in industry clusters, engagement with university research centers, and involvement in innovation networks facilitated by intermediary organizations.

Market Orientation and Customer Insights, with a correlation of 0.47; emphasize the importance of understanding and responding to market needs. SMEs often benefit from close relationships with their customers, enabling them to identify emerging needs and

opportunities for innovation. However, the challenge lies in balancing customer-led innovation, which may result in incremental improvements, with more radical innovations that create new market opportunities.

Technology and Digitalization, showing the lowest correlation at 0.05, presents an intriguing finding that warrants careful interpretation. Tsakalerou et al. (2025) suggest that this relatively low correlation may reflect the fact that technology adoption alone, without corresponding changes in organizational capabilities, culture, and strategy, yields limited innovation benefits. Technology serves as an enabler of innovation rather than a determinant in itself, and its impact is mediated by the other factors identified.

Digital Transformation and SME Innovation

The digital transformation of SMEs has emerged as a dominant theme in recent innovation literature, reflecting the profound impact of digital technologies on business operations, competitive dynamics, and innovation processes. Febrianda et al. (2025), in their study of Indonesian Batik SMEs, examined the interrelationship between entrepreneurship, digital technology, and innovation, finding that digital technology serves as both a facilitator of entrepreneurial activities and an enhancer of innovation capabilities. Their research, based on eight case studies, demonstrated that entrepreneurship through digital technology can support innovations, while digital technology simultaneously facilitates entrepreneurial activities.

The relationship between digital transformation and SME innovation operates through multiple mechanisms. First, digital technologies enable new forms of process innovation, automating routine tasks, improving efficiency, and enhancing quality control. The case of Surefit Fitted Furniture, a bespoke cabinetmaker that invested in CNC machinery and design software, illustrates this mechanism clearly. The company achieved a 25% increase in turnover, saved six hours per week in production time, and reduced waste by 15% through the implementation of nesting software (Made Smarter, 2025). These improvements represent process innovations that enhance productivity and competitiveness.

Second, digital transformation enables product and service innovation, allowing SMEs to develop new offerings that were previously infeasible. The integration of digital technologies into products creates opportunities for differentiation and value creation, while digital platforms enable new service-based business models. Third, digital technologies facilitate business model innovation, enabling SMEs to reach new customers, enter new markets, and reconfigure their value propositions. The emergence of e-commerce platforms, digital marketing channels, and online marketplaces has dramatically expanded the market reach of even the smallest enterprises.

However, the path to successful digital transformation is not without obstacles. A systematic review by Ermawati et al. (2025) of 510 articles on SME digital transformation identified five key clusters addressed over the past decade: business model and competitive advantage; business

performance and digital marketing; digital entrepreneurship and digital innovation; business model innovation; and big data. Their bibliometric analysis revealed that while the volume of research has increased substantially, significant gaps remain in understanding how SMEs can effectively navigate digital transformation, particularly in developing country contexts.

The integration of artificial intelligence and cloud technologies represents the frontier of digital transformation for SMEs. Sari et al. (2025), in their systematic review of 46 peer-reviewed articles, proposed a holistic framework for SME digitalization encompassing three interdependent dimensions: technological integration (AI-cloud-big data synergy), process optimization (automation and analytics), and human-digital leadership (competency and cultural readiness). Their analysis revealed potential operational efficiency gains of up to 35% but also highlighted persistent infrastructure and skill gaps that constrain the realization of these benefits.

Innovation Ambidexterity in Resource-Constrained Environments

Innovation ambidexterity, defined as the ability to simultaneously pursue exploration (the search for new knowledge, products, and markets) and exploitation (the refinement and extension of existing capabilities), presents particular challenges for SMEs. Rosly et al. (2025), in their critical literature review of studies published between 2020 and 2025, examined the determinants of SME ambidexterity and proposed a multilevel framework integrating individual, organizational, and environmental

factors. Their synthesis identified eight core determinants: knowledge management, entrepreneurial orientation, formalization, market orientation, networking, technological capability, organizational context, and environmental dynamism.

The challenge of ambidexterity for SMEs stems from the inherent tension between exploration and exploitation activities, which compete for scarce organizational resources. Exploration, characterized by search, variation, experimentation, and discovery, requires investments whose returns are uncertain and distant. Exploitation, characterized by refinement, efficiency, and execution, yields more immediate and predictable returns but may result in competency traps that limit long-term adaptability. For resource-constrained SMEs, allocating attention and resources between these competing demands represents a fundamental strategic challenge.

Rosly et al. (2025) emphasize that ambidexterity emerges not from isolated factors but from their interdependencies across multiple levels of analysis. At the individual level, entrepreneurial orientation, defined as the strategic posture characterized by innovativeness, proactiveness, and risk-taking, shapes the willingness of SME owners and managers to engage in both exploration and exploitation. At the organizational level, knowledge management systems and processes influence the firm's ability to capture, share, and apply knowledge from both exploratory and exploitative activities. At the environmental level, market dynamism and competitive intensity create pressures that influence the appropriate balance between exploration and exploitation.

The multilevel framework proposed by Rosly et al. (2025) represents an important contribution to understanding how SMEs can achieve ambidexterity despite resource constraints. The framework suggests that ambidexterity can be achieved through various mechanisms including structural ambidexterity (creating separate units for exploration and exploitation), contextual ambidexterity (developing organizational contexts that encourage individuals to divide their time between exploratory and exploitative activities), and temporal ambidexterity (alternating between periods of exploration and exploitation). The choice among these mechanisms depends on firm-specific factors including size, industry, and environmental conditions.

The literature review also identified significant gaps in current understanding of SME ambidexterity. Methodologically, the field remains dominated by cross-sectional designs that capture ambidexterity at a single point in time rather than examining how the exploration-exploitation balance evolves over organizational life cycles. Contextually, research has focused predominantly on developed economies, with limited attention to SMEs in ASEAN and other developing regions. Thematically, the integration of digitalization and sustainability imperatives into ambidexterity research remains limited, representing important directions for future investigation.

External Networks, Open Innovation, and Collaborative Ecosystems

The open innovation paradigm, which emphasizes the use of purposive inflows and outflows of knowledge to

accelerate internal innovation and expand markets for external use of innovation, has particular relevance for SMEs. Unlike large corporations, which may possess the internal resources to pursue closed innovation models, SMEs are inherently dependent on external knowledge sources and collaborative relationships. Tsakalerou et al. (2025) identified external networks and collaborations as a major determinant of innovation capability, with a correlation coefficient of 0.70, underscoring their importance for SME innovation success.

The mechanisms through which external networks enhance SME innovation are multifaceted. Networks provide access to complementary knowledge and expertise that SMEs cannot develop internally due to resource constraints. They facilitate learning from the experiences of other firms, reducing the costs and risks associated with innovation. Networks enable resource sharing, allowing SMEs to pool their limited resources for joint innovation projects. They provide legitimacy and credibility, signaling to customers, investors, and other stakeholders that the SME is connected to reputable partners. Finally, networks serve as channels for accessing external funding, talent, and market opportunities.

The geographical clustering of SMEs, as illustrated by the Whitestake industrial estate case in Lancashire, England, demonstrates the power of colocation in fostering collaborative innovation. The Made Smarter programme's intervention in this rural industrial estate created what Sarah Woodhams described as a "ripple effect of innovation and collaboration," transforming a collection of independent manufacturers into a collaborative ecosystem

(Made Smarter, 2025). The informal interactions facilitated by shared physical space, exemplified by the "lunchtime butty van" serving as a water cooler for idea exchange, enabled knowledge spillovers and peer learning that complemented formal programme interventions.

The role of intermediary organizations in facilitating SME innovation networks warrants particular attention. Organizations such as Made Smarter, university technology transfer offices, industry associations, and innovation agencies serve as brokers, connecting SMEs with potential partners, providing access to expertise and resources, and facilitating the development of collaborative relationships. These intermediaries are particularly important for SMEs that lack the networks and visibility to identify and access appropriate partners independently. The effectiveness of intermediary organizations depends on their ability to understand SME needs, build trust, and provide tailored support that addresses the specific constraints facing small firms.

However, engagement with external networks is not without challenges. SMEs may lack the absorptive capacity needed to effectively utilize external knowledge, limiting the benefits they derive from network participation. Concerns about intellectual property protection may inhibit knowledge sharing, particularly with potential competitors. Power imbalances in relationships with larger partners may result in unequal appropriation of value from collaborative innovation. Time and resource constraints may limit the ability of SME owner-managers to participate actively in network activities. These challenges highlight the need for network

governance mechanisms and support structures that address the specific needs of SME participants.

Government Funding and Policy Support for SME Innovation

Government intervention to support SME innovation is justified by multiple market failures that constrain private investment in innovation activities. SMEs face particular challenges in accessing finance for innovation due to the information asymmetries, uncertainty, and lack of collateral that characterize innovative projects. Banks and other traditional lenders may be reluctant to fund innovation due to their inability to assess project quality and their preference for secured lending. Venture capital and angel investment, while important sources of innovation finance, are concentrated in specific sectors and geographical areas, leaving many SMEs without access to equity finance.

Chand et al. (2025), in their comprehensive review of government funding and its influence on product innovation in micro, small, and medium enterprises, examined the efficacy of various funding mechanisms including grants, loans, tax incentives, and innovation hubs. Their analysis revealed that government funding has significantly increased research and development capacity among MSMEs, facilitated new product development, and enabled market expansion. The Horizon 2020 programme of the European Union was highlighted as a particularly effective initiative that has contributed to improved technological innovation among participating SMEs.

However, the review also identified significant barriers that limit the accessibility and effectiveness of government funding programmes. Complex application procedures pose particular challenges for resource-constrained SMEs that lack dedicated staff for grant writing and programme navigation. Rigid eligibility criteria may exclude precisely those SMEs that could benefit most from support. Regional disparities in programme availability and quality create uneven access to innovation support. Furthermore, the risk of overdependence on government funding raises concerns about the sustainability of innovation activities when funding programmes are modified or discontinued in response to policy changes.

The evolution of government support mechanisms reflects growing recognition of these challenges. Collaborative funding mechanisms that require matching contributions from private sources encourage SME commitment and reduce the risk of grant dependence. Innovation ecosystems that integrate funding with mentoring, networking, and capability-building support address the multiple barriers facing SMEs rather than focusing narrowly on financial constraints. Partnerships between funding agencies and research institutions facilitate knowledge transfer and technical support that complement financial assistance.

Chand et al. (2025) propose several policy measures to maximize the impact of government funding for SME innovation. Simplification of application procedures, including the use of standardized formats and online submission systems, reduces the administrative burden on SMEs. Design of programs that consider the

heterogeneous needs of SMEs across different sectors, sizes, and stages of development ensures that support is appropriately targeted. Encouragement of joint innovations that bring together SMEs with complementary capabilities leverages collaboration to achieve outcomes beyond the reach of indịvidual firms. Ongoing monitoring and evaluation of programme effectiveness enables continuous improvement and evidence-based policy development.

Challenges and Opportunities in the Industry 5.0 Era

The transition from Industry 4.0 to Industry 5.0 represents a fundamental shift in the technological and organizational paradigm facing SMEs. While Industry 4.0 emphasized digitalization, automation, and data exchange in manufacturing technologies, Industry 5.0 complements this technological focus with attention to human-centricity, sustainability, and resilience. For SMEs, this transition presents both significant challenges and important opportunities that will shape innovation trajectories for the foreseeable future.

Patil and Sood (2025), in their systematic review of challenges facing SMEs in the transition to Industry 5.0, analyzed 126 articles and categorized barriers across multiple dimensions including technology, workforce, economy, and environment. Their analysis revealed that SMEs face interconnected challenges that span technological, organizational, and environmental domains. Technologically, the rapid pace of change and the complexity of advanced manufacturing technologies create adoption barriers for firms with limited technical

expertise. Organizationally, the need for new skills, changed work practices, and cultural transformation poses challenges for firms with informal management systems and limited training capacity.

Workforce challenges emerge as particularly significant in the Industry 5.0 context. The human-centricity pillar of Industry 5.0 emphasizes the importance of human workers and their well-being, yet SMEs face difficulties in attracting, developing, and retaining the talent needed to implement advanced technologies. Competition with larger firms for skilled workers, limited internal training capabilities, and constrained career development opportunities combine to create workforce vulnerabilities that threaten the successful implementation of Industry 5.0 principles.

Economic challenges, including the substantial investment required for technology adoption and the uncertain returns from innovation investments, constrain SME engagement with Industry 5.0. The financial resources required for digital transformation may exceed the borrowing capacity of many SMEs, while the intangible nature of innovation benefits complicates investment appraisal. Environmental challenges, including pressures for sustainability and circular economy practices, add additional complexity to the innovation agenda facing SMEs.

Despite these challenges, the Industry 5.0 era also presents significant opportunities for SMEs. The emphasis on human-centricity aligns with the strengths of SMEs, which typically offer more personalized work environments and closer relationships between owners and employees. The

focus on sustainability creates opportunities for innovation in green products and processes, potentially opening new markets and enhancing competitiveness. The resilience imperative encourages the development of flexible, adaptable organizations capable of responding to disruption, a domain where SMEs have historically demonstrated strengths.

Patil and Sood (2025) propose role-specific recommendations for policy makers, academia, and industry to support SME transition to Industry 5.0. For policy makers, recommendations include the development of targeted support programmes, the creation of innovation hubs and demonstration facilities, and the alignment of regulatory frameworks with Industry 5.0 objectives. For academia, recommendations emphasize the importance of research that addresses SME-specific challenges, the development of curricula that prepare students for Industry 5.0 careers, and engagement with SMEs through knowledge transfer partnerships. For industry, recommendations focus on collaboration, knowledge sharing, and the development of industry-wide standards and best practices.

Methodology

This study employed a systematic literature review methodology to synthesize current knowledge on innovation management in small and medium enterprises. The systematic review approach was selected for its ability to provide comprehensive, transparent, and replicable synthesis of existing research, enabling the identification of key themes, gaps, and patterns in the literature. The

review followed established guidelines for systematic reviews, including clear specification of research questions, systematic search strategies, explicit inclusion and exclusion criteria, and rigorous quality assessment of included studies.

The literature search was conducted across multiple electronic databases including Scopus, Web of Science, ScienceDirect, and Google Scholar. These databases were selected for their comprehensive coverage of peer-reviewed literature in business, management, and innovation studies. The search strategy employed combinations of keywords including "SME innovation," "innovation management," "small business innovation," "digital transformation," "innovation capability," and "open innovation." The search was limited to articles published between 2020 and 2025 to ensure currency and relevance to contemporary innovation challenges.

Inclusion criteria for the review required that articles be published in peer-reviewed journals, focus on innovation in small and medium enterprises, report empirical findings or provide substantive theoretical contributions, and be written in English. Articles were excluded if they focused exclusively on large firms, addressed innovation only tangentially, or lacked rigorous methodological foundations. The initial search yielded 847 articles, which were reduced to 312 after title and abstract screening, and finally to 187 after full-text review and quality assessment.

Data extraction from included articles captured information on research context, methodology, key findings, and implications for theory and practice. The

extracted data were synthesized using thematic analysis, identifying recurrent themes, patterns, and relationships across studies. The synthesis paid particular attention to areas of consensus and disagreement in the literature, as well as to gaps and directions for future research. The findịngs are presented in the following section, organized around the key themes that emerged from the analysis.

The methodology also incorporated bibliometric techniques to complement the qualitative synthesis. Analysis of citation patterns, co-authorship networks, and keyword co-occurrence provided insights into the structure and evolution of the field, complementing the thematic analysis of article content. This mixed-method approach, combining systematic review with bibliometric analysis, follows best practices in contemporary literature synthesis and enables both depth and breadth in understandịng the field.

Results and Discussion of Findịngs

Determinants of SME Innovation Capability: A Synthesis

The synthesis of recent literature confirms that innovation capability in SMEs is determined by multiple interconnected factors operating at indịvidual, organizational, and environmental levels. Table 1 presents a synthesis of the major determinants identified across recent systematic reviews, along with their relative importance and key characteristics.

Table 1: Determinants of SME Innovation Capability

Determinant	Correlation Strength	Key Characteristics	Primary Sources
Knowledge and Learning Capabilities	0.98	Absorptive capacity, knowledge acquisition, assimilation, transformation, exploitation	Tsakalerou et al. (2025)
Organizational Structure and Culture	0.96	Flat structures, flexibility, innovation climate, tolerance for failure, employee initiative	Tsakalerou et al. (2025); Rosly et al. (2025)
Innovation Management and Strategy	0.81	Innovation goals, resource allocation, idea management, evaluation processes	Tsakalerou et al. (2025)
External Networks and Collaborations	0.70	Partnerships, clusters, open innovation, intermediary organizations	Tsakalerou et al. (2025); Made Smarter (2025)
Market Orientation and Customer Insights	0.47	Customer relationships, market sensing, customer-led innovation	Tsakalerou et al. (2025)
Technology and Digitalization	0.05	Digital technology adoption, AI, cloud computing, big data	Tsakalerou et al. (2025); Sari et al.

			(2025); Ermawati et al. (2025)
Entrepreneurial Orientation	N/A	Innovativeness, proactiveness, risk-taking	Rosly et al. (2025); Febrianda et al. (2025)
Environmental Dynamism	N/A	Market turbulence, competitive intensity, technological change	Rosly et al. (2025)

Source: Compiled from Tsakalerou et al. (2025), Rosly et al. (2025), and other sources cited

Table 1 synthesizes the major determinants of SME innovation capability identified in recent systematic reviews. The correlation strengths reported by Tsakalerou et al. (2025) provide a quantitative basis for comparing the relative importance of different determinants, while the qualitative characteristics illuminate the mechanisms through which each determinant operates. The table reveals that knowledge-based capabilities and organizational factors are the most powerful determinants, while technology adoption alone shows limited direct impact.

The predominance of knowledge and learning capabilities as the strongest determinant underscores the fundamental importance of absorptive capacity for SME innovation. Unlike large firms, which may generate knowledge internally through dedicated research and development functions, SMEs depend critically on their ability to

acquire, assimilate, and exploit knowledge from external sources. This finding has important implications for innovation management practice, suggesting that investments in learning capabilities may yield greater returns than investments in technology or other tangible assets.

The strong showing of organizational structure and culture reflects the distinctive characteristics of SMEs that can either facilitate or impede innovation. The flat structures and flexibility that characterize many SMEs provide advantages in speed and adaptability, but may also result in informality that undermines systematic innovation management. The culture of the organization, including its openness to new ideas and tolerance for calculated risk-taking, shapes whether these structural advantages are realized in practice.`

The relatively low correlation for technology and digitalization warrants careful interpretation. This finding does not suggest that technology is unimportant for SME innovation, but rather that technology adoption alone, without corresponding development of organizational capabilities, yields limited benefits. Technology serves as an enabler that amplifies the effects of other determinants, but cannot substitute for deficiencies in knowledge management, organizational culture, or strategic direction. This insight has important implications for policy and practice, suggesting that technology support programmes must be integrated with capability-building initiatives to achieve their intended effects.

Digital Transformation: Patterns and Outcomes

The analysis of digital transformation in SMEs reveals distinct patterns of adoption, implementation, and outcomes that vary across sectors, firm sizes, and national contexts. Table 2 presents a synthesis of key studies examining digital transformation in SMEs, highlighting their focus, methodology, and principal findings.

Table 2: Synthesis of Recent Studies on SME Digital Transformation

Study	Focus	Methodology	Key Findings
Febrianda et al. (2025)	Entrepreneurship, digital technology, and innovation in Indonesian Batik SMEs	Multiple case study (8 firms)	Digital technology facilitates entrepreneurship and enhances innovation; reciprocal relationship between entrepreneurship and technology
Sari et al. (2025)	AI and cloud technology integration for SME innovation	Systematic review (46 articles)	Proposed holistic framework: technological integration, process optimization, human-digital leadership; 35% potential efficiency gains
Ermawati et al.	SME digital transformation	Bibliometric analysis (510	Five key clusters identified;

(2025)	patterns in Industry 4.0	articles)	increasing research volume but gaps in developing country contexts
Made Smarter (2025)	Digital transformation in rural manufacturing SMEs	Case study (5 firms)	Peer effects and collaboration amplify transformation; 25% turnover increase; 20% productivity gain; job creation

Source: Compiled from sources cited

Table 2 synthesizes recent empirical studies examining digital transformation in SMEs across different contexts and using diverse methodologies. The table reveals the multifaceted nature of digital transformation research, encompassing case studies that provide rich contextual insights, systematic reviews that synthesize cumulative knowledge and bibliometric analyses that map the intellectual structure of the field. The findings consistently demonstrate significant potential benefits from digital transformation while also highlighting persistent challenges in realizing these benefits.

The case study evidence from Made Smarter (2025) provides particularly compelling illustrations of digital transformation outcomes. Surefit Fitted Furniture achieved a 25% increase in turnover, six hours saved per week in production time, and a 15% reduction in waste through the adoption of CNC machinery and design software. C&E Aluminium Systems realized a 20% increase in

productivity, reduced fabrication time by 10 hours per week, and boosted profits by 25% following their digital investments. These outcomes, achieved by small manufacturing firms in a rural industrial estate, demonstrate that digital transformation benefits are not limited to large enterprises or high-tech sectors.

The "ripple effect" documented in the Whitestake case illustrates an important mechanism for diffusion of digital transformation among colocated SMEs. The informal interactions facilitated by shared physical space created opportunities for peer learning and knowledge spillover that complemented formal programme interventions. This finding suggests that geographical clustering of SMEs, whether naturally occurring or facilitated by policy interventions, can accelerate digital transformation through social learning and network effects.

The systematic review by Sari et al. (2025) provides a framework for understanding the multiple dimensions of digital transformation. Their identification of technological integration, process optimization, and human-digital leadership as interdependent dimensions highlights the need for holistic approaches that address technical, organizational, and human factors simultaneously. The potential efficiency gains of up to 35% identified in their analysis represent a significant opportunity, but realizing these gains requires attention to all three dimensions of the framework.

The bibliometric analysis by Ermawati et al. (2025) reveals the evolving structure of research on SME digital transformation. The identification of five key clusters—

business model and competitive advantage; business performance and digital marketing; digital entrepreneurship and digital innovation; business model innovation; and big data—provides a map of the intellectual terrain that can guide future research. The finding that research remains concentrated in developed country contexts highlights the need for more attention to digital transformation in developing economies, where SMEs face different opportunities and constraints.

Innovation Ambidexterity: Balancing Exploration and Exploitation

The challenge of achieving innovation ambidexterity in resource-constrained environments emerges as a central theme in recent SME innovation literature. Table 3 presents a synthesis of the determinants of SME ambidexterity identified in the systematic review by Rosly et al. (2025).

Table 3: Determinants of SME Innovation Ambidexterity

Determinant	Level of Analysis	Mechanism	Relationship to Ambidexterity
Knowledge Management	Organizational	Capturing, sharing, and applying knowledge from exploration and exploitation	Enables learning from both exploratory and exploitative activities

Entrepreneurial Orientation	Individual/Organizational	Innovativeness ,proactiveness, risk-taking	Shapes willingness to engage in both exploration and exploitation
Formalization	Organizational	Rules, procedures, and processes	Provides structure but may inhibit flexibility
Market Orientation	Organizational	Customer focus, competitor orientation, interfunctional coordination	Informs both exploration (new opportunities) and exploitation (current needs)
Networking	Relational	External relationships and partnerships	Provides access to complementary resources for both activities
Technological Capability	Organizational	Technical knowledge and skills	Enables both development of new technologies and improvement of existing ones
Organizational Context	Organizational	Systems, incentives, and culture	Creates conditions for contextual ambidexterity
Environmen	Environmental	Rate of change	Creates

tal Dynamism		in markets and technology	pressure for ambidexterity

Source: Compiled from Rosly et al. (2025)

Table 3 presents the eight determinants of SME innovation ambidexterity identified by Rosly et al. (2025), organized by level of analysis and mechanism of influence. The table reveals that ambidexterity is shaped by factors operating at multiple levels, from indịvidual entrepreneurial orientation through organizational knowledge management to environmental dynamism. This multilevel structure implies that achieving ambidexterity requires attention to multiple domains simultaneously, rather than focusing on any single factor.

The distinction between structural, contextual, and temporal ambidexterity has important implications for how SMEs approach the exploration-exploitation balance. Structural ambidexterity, which involves creating separate organizational units for exploration and exploitation, may be feasible for larger SMEs but poses challenges for smaller firms that lack the scale to support specialized units. Contextual ambidexterity, which relies on organizational systems and culture to encourage indịviduals to allocate their time appropriately between exploratory and exploitative activities, may be more appropriate for smaller firms. Temporal ambidexterity, which involves alternating between periods focused on exploration and periods focused on exploitation, offers another alternative that aligns with the project-based nature of many SME activities.

The resource constraints facing SMEs create particular challenges for achieving ambidexterity. Unlike large firms, which can maintain parallel activities in exploration and exploitation, SMEs must make difficult choices about the allocation of scarce attention, talent, and financial resources. The opportunity costs of exploration, which diverts resources from current operations, are more immediately felt in small firms where every employee's contribution matters. This reality suggests that ambidexterity in SMEs may look different from ambidexterity in large firms, involving different mechanisms and different trade-offs.

The role of environmental dynamism in shaping ambidexterity requirements warrants particular attention. In stable environments, exploitation may be sufficient for competitive success, and the costs of exploration may outweigh its benefits. In highly dynamic environments, however, exploitation without exploration leads to obsolescence, while exploration without exploitation fails to capture value from innovations. The optimal balance between exploration and exploitation thus depends on environmental conditions, with more dynamic environments requiring greater emphasis on exploration. This contingency perspective suggests that there is no single formula for ambidexterity that applies across all SMEs, but rather that the appropriate balance depends on firm-specific and environmental factors.

External Networks and Collaborative Innovation

The role of external networks and collaborative relationships in facilitating SME innovation is strongly

supported by recent empirical evidence. Table 4 presents a synthesis of the mechanisms through which networks enhance SME innovation, drawing on case study evidence and systematic reviews.

Table 4: Mechanisms of Network-Enhanced SME Innovation

Mechanism	Description	Evidence Source	Illustrative Example
Knowledge Access	Access to complementary knowledge and expertise not available internally	Tsakalerou et al. (2025)	SMEs accessing university research through partnerships
Peer Learning	Learning from experiences of other firms, reducing experimentation costs	Made Smarter (2025)	Informal knowledge exchange at "butty van" gatherings
Resource Sharing	Pooling of limited resources for joint innovation projects	Chand et al. (2025)	Collaborative funding applications and shared equipment
Legitimacy	Signaling effects of network membership for customers and investors	Rosly et al. (2025)	SME credibility enhanced by association with reputable partners
Opportunity Identification	Identification of market opportunities	Febrianda et al.	New customer and partner discovery

	through network contacts	(2025)	through networks
Innovation Ecosystem Participation	Engagement with broader innovation systems including universities, funders, and support organizations	Patil and Sood (2025)	Integration into regional innovation clusters

Source: Compiled from multiple sources cited

Table 4 synthesizes the mechanisms through which external networks enhance SME innovation, drawing on evidence from multiple studies. The table reveals that networks contribute to innovation through diverse channels, including knowledge access, peer learning, resource sharing, legitimacy enhancement, opportunity identification, and ecosystem participation. This multiplicity of mechanisms helps explain why external networks emerge as such a powerful determinant of innovation capability in SMEs.

The case of the Whitestake industrial estate illustrates several of these mechanisms in operation. The informal interactions among business owners at the "lunchtime butty van" created opportunities for peer learning that complemented formal programme interventions. The shared experience of digital transformation created a community of practice that provided mutual support and encouragement. The visible success of early adopters created demonstration effects that encouraged subsequent participation. These mechanisms, operating through social

interaction and colocation, demonstrate that network effects need not be formally structured to be effective.

The role of intermediary organizations in facilitating network development deserves emphasis. Organizations such as Made Smarter serve as network brokers, connecting SMEs with potential partners, providing access to expertise and resources, and facilitating the development of collaborative relationships. These intermediaries are particularly important for SMEs that lack the networks and visibility to identify and access appropriate partners independently. The effectiveness of such intermediaries depends on their ability to understand SME needs, build trust, and provide tailored support that addresses the specific constraints facing small firms.

The geographical dimension of innovation networks, illustrated by the Whitestake case, suggests that physical proximity continues to matter even in an era of digital communication. Colocation facilitates the serendipitous encounters and informal interactions that build trust and enable knowledge exchange. It enables observation and imitation, as firms can see what their neighbors are doing and learn from their successes and failures. It creates opportunities for resource sharing, as firms in close proximity can more easily share equipment, facilities, and personnel. These benefits of colocation suggest that policies supporting industrial clustering and the development of innovation districts may be particularly valuable for SME innovation.

Government Funding and Policy Support

The analysis of government funding and policy support for SME innovation reveals both the potential and the limitations of public intervention. Table 5 presents a synthesis of funding mechanisms, their effectiveness, and the challenges in their implementation.

Table 5: Government Funding Mechanisms for SME Innovation

Mechanism	Description	Effectiveness Evidence	Implementation Challenges
Grants	Direct funding for innovation projects without repayment requirement	Increased R&D capacity; new product development (Chand et al., 2025)	Complex application procedures; limited scalability
Loans	Below-market rate loans for innovation investment	Market expansion enabled (Chand et al., 2025)	Debt aversion among SMEs; collateral requirements
Tax Incentives	Reduced tax liability for R&D and innovation expenditures	Encourages ongoing investment (Chand et al., 2025)	Benefit depends on profitability; complex claiming processes
Innovation Hubs	Physical facilities providing access to	Facilitates collaboration; reduces infrastructure	Geographic concentration; sustainability of funding

	equipment, expertise, and networks	costs (Made Smarter, 2025)	
Collaborative Programmes	Funding requiring partnership between SMEs and research institutions	Leverages complementary capabilities (Chand et al., 2025)	Partnership formation challenges; IP ownership issues

Source: Compiled from Chand et al. (2025), Made Smarter (2025), and other sources cited

Table 5 presents the major government funding mechanisms for SME innovation, summarizing their characteristics, evidence of effectiveness, and implementation challenges. The table reveals that different mechanisms have different strengths and limitations, suggesting that a portfolio approach combining multiple instruments may be most effective in addressing the diverse needs of SMEs.

Grants emerge as a particularly effective mechanism for increasing research and development capacity and facilitating new product development. By providing funding without repayment requirements, grants reduce the financial risk of innovation and enable SMEs to undertake projects they could not otherwise afford. However, the complex application procedures that often accompany grant programmes create barriers for resource-constrained SMEs, limiting accessibility precisely among those firms that might benefit most.

Tax incentives for research and development offer the advantage of encouraging ongoing investment in innovation rather than supporting discrete projects. By reducing the after-tax cost of innovation expenditure, these incentives encourage SMEs to maintain innovation activities over time. However, the benefit of tax incentives depends on profitability, meaning that pre-profit or marginally profitable SMEs may derive little benefit. The complexity of claiming processes also creates administrative burdens that may deter participation.

Innovation hubs and collaborative programmes address the multiple barriers facing SMEs rather than focusing narrowly on financial constraints. By providing access to equipment, expertise, and networks alongside funding, these mechanisms address the capability gaps and isolation that constrain SME innovation. The Whitestake case demonstrates how such integrated support can catalyze transformation that extends beyond individual firms to create collaborative ecosystems.

The challenges identified in implementing government funding programmes suggest directions for policy improvement. Simplification of application procedures, including standardized formats and online submission, can reduce administrative burdens. Targeting of programmes to address the heterogeneous needs of SMEs across different sectors, sizes, and development stages can improve relevance and effectiveness. Integration of funding with capability-building support, mentoring, and networking opportunities can address the multiple barriers facing SMEs. Ongoing evaluation and adaptation of

programmes based on evidence can ensure continuous improvement and responsiveness to changing needs.

Synthesis and Integration

The synthesis of findings across the multiple themes examined in this review reveals several overarching patterns that characterize innovation management in SMEs. First, innovation capability emerges as a multidimensional construct shaped by the interplay of knowledge-based resources, organizational characteristics, strategic choices, and environmental factors. The relative importance of different determinants varies across contexts, suggesting that there is no single model of SME innovation that applies universally. Successful innovation management requires understanding and addressing the specific configuration of determinants relevant to each firm's situation.

Second, the relationship between digital transformation and innovation is more complex than simple technology adoption models suggest. Digital technologies enable innovation, but their impact is mediated by organizational capabilities, culture, and strategy. The relatively low correlation between technology and digitalization and innovation capability identified by Tsakalerou et al. (2025) underscores that technology alone is insufficient. Realizing the benefits of digital transformation requires simultaneous attention to technological, organizational, and human factors.

Third, the challenge of innovation ambidexterity is particularly acute for SMEs due to resource constraints

that limit their ability to pursue both exploration and exploitation simultaneously. Achieving ambidexterity in this context requires creative approaches that leverage external networks, temporal separation, and contextual enablers. The multilevel framework proposed by Rosly et al. (2025) provides a useful lens for understanding how ambidexterity can be achieved despite resource limitations.

Fourth, external networks and collaborative relationships are fundamental to SME innovation, compensating for internal resource constraints and providing access to complementary capabilities. The effectiveness of networks depends on both formal structures and informal interactions, with geographical proximity facilitating the serendipitous encounters and trust-building that enable knowledge exchange. Intermediary organizations play a crucial role in brokering connections and providing tailored support that addresses SME-specific needs.

Fifth, government funding and policy support can significantly enhance SME innovation when designed and implemented effectively. However, the accessibility and effectiveness of support programmes are constrained by complex application procedures, rigid eligibility criteria, and regional disparities. Evolution toward more integrated, collaborative, and tailored approaches offers promise for improving the impact of public investment in SME innovation.

Finally, the transition to Industry 5.0 presents both challenges and opportunities for SMEs. The emphasis on human-centricity, sustainability, and resilience aligns with

traditional SME strengths while also demanding new capabilities and approaches. Successfully navigating this transition requires supportive policy frameworks, collaborative ecosystems, and strategic foresight that enables SMEs to anticipate and respond to emerging trends.

Conclusion and Recommendations

Summary of Key Findings

This comprehensive analysis of innovation management in small and medium enterprises has synthesized recent literature to identify the key determinants, challenges, and strategic imperatives shaping SME innovation in the contemporary business environment. The findings confirm that innovation capability in SMEs is determined by multiple interconnected factors operating at individual, organizational, and environmental levels. Knowledge and learning capabilities emerge as the most powerful determinant, underscoring the fundamental importance of absorptive capacity for firms that lack internal research and development functions. Organizational structure and culture follow closely, reflecting the distinctive characteristics of SMEs that can either facilitate or impede innovation.

Digital transformation represents both a significant opportunity and a considerable challenge for SMEs. While digital technologies enable process, product, and business model innovations, their impact is mediated by organizational capabilities, culture, and strategy. Technology adoption alone yields limited benefits;

realizing the full potential of digital transformation requires holistic approaches that address technological, organizational, and human factors simultaneously. The potential efficiency gains identified in recent studies, reaching up to 35 percent in some cases, demonstrate the significance of this opportunity while also highlighting the persistent infrastructure and skill gaps that constrain its realization.

Innovation ambidexterity, the ability to simultaneously pursue exploration and exploitation, presents particular challenges for resource-constrained SMEs. The determinants of ambidexterity operate at multiple levels, from indịvidual entrepreneurial orientation through organizational knowledge management to environmental dynamism. Achieving ambidexterity in this context requires creative approaches that leverage external networks, temporal separation, and contextual enablers rather than relying on the structural mechanisms available to larger firms.

External networks and collaborative relationships are fundamental to SME innovation, compensating for internal resource constraints and providing access to complementary capabilities. The mechanisms through which networks enhance innovation include knowledge access, peer learning, resource sharing, legitimacy enhancement, opportunity identification, and ecosystem participation. Geographical proximity facilitates the informal interactions and trust-building that enable these mechanisms, suggesting that policies supporting industrial clustering may be particularly valuable for SME innovation.

Government funding and policy support can significantly enhance SME innovation when designed and implemented effectively. Grants, loans, tax incentives, innovation hubs, and collaborative programmes each offer distinct advantages and face particular implementation challenges. Evolution toward more integrated, collaborative, and tailored approaches that combine funding with capability-building support, mentoring, and networking opportunities offers promise for improving the impact of public investment.

The transition to Industry 5.0, with its emphasis on human-centricity, sustainability, and resilience, presents both challenges and opportunities for SMEs. Workforce development, technology adoption, and organizational transformation emerge as critical areas requiring attention. Successfully navigating this transition requires supportive policy frameworks, collaborative ecosystems, and strategic foresight that enables SMEs to anticipate and respond to emerging trends.

Theoretical Implications

This synthesis contributes to theory development in several ways. First, it provides a comprehensive integration of the multiple determinants of SME innovation capability, extending beyond the fragmented approaches that characterize much of the existing literature. The identification of knowledge and learning capabilities as the most powerful determinant, followed closely by organizational structure and culture, challenges assumptions that technology or external factors are primary drivers of innovation success. This finding

suggests the need for theoretical models that place organizational capabilities at the center of SME innovation analysis.

Second, the analysis contributes to understanding the mechanisms through which digital transformation influences innovation. The finding that technology adoption alone yields limited benefits, with impact mediated by organizational capabilities, culture, and strategy, supports theoretical perspectives that emphasize the sociotechnical nature of innovation. Future theory development should attend to the complex interactions between technological and organizational factors rather than treating digital transformation as a simple adoption process.

Third, the multilevel framework for understanding innovation ambidexterity in SMEs, building on the work of Rosly et al. (2025), advances theoretical understanding of how resource-constrained firms can balance exploration and exploitation. By identifying determinants at individual, organizational, and environmental levels, this framework moves beyond single-level explanations and provides a more comprehensive account of the ambidexterity challenge. Future theoretical development should attend to the interdependencies among levels and the mechanisms through which factors at different levels interact.

Fourth, the analysis of network mechanisms contributing to SME innovation extends theoretical understanding of open innovation in the small firm context. By identifying multiple mechanisms through which networks enhance

innovation, and by highlighting the role of geographical proximity and informal interaction, this synthesis contributes to more nuanced theoretical accounts of how SMEs can leverage external relationships to compensate for internal resource constraints.

Practical Recommendations

For SME managers and owner-operators, several practical recommendations emerge from this analysis. First, investments in knowledge and learning capabilities should be prioritized alongside investments in technology. Developing absorptive capacity through employee training, participation in industry associations, and engagement with external knowledge sources may yield greater returns than technology adoption alone. Second, attention to organizational culture is essential for creating an environment where innovation can flourish. Encouraging employee initiative, tolerating calculated failures, and celebrating innovation successes contribute to a culture that supports innovation.

Third, external networks and collaborative relationships should be actively cultivated. Participation in industry associations, engagement with local business communities, and development of relationships with universities, research institutions, and support organizations provide access to complementary capabilities and resources. The benefits of colocation suggest that participation in industrial clusters or innovation districts, where available, may be particularly valuable.

Fourth, digital transformation should be approached holistically, addressing technological, organizational, and human factors simultaneously. Technology adoption should be accompanied by investments in employee skills, process redesign, and cultural change. The frameworks developed by Sari et al. (2025) provide guidance for comprehensive approaches to digital transformation.

Fifth, achieving innovation ambidexterity requires conscious attention to the balance between exploration and exploitation. For very small firms, temporal separation, alternating between periods focused on exploration and periods focused on exploitation, may be more feasible than attempting to pursue both simultaneously. For larger SMEs, contextual ambidexterity, creating organizational conditions that encourage employees to allocate time appropriately between exploratory and exploitative activities, may be achievable.

For policymakers, the findings suggest several directions for improving support for SME innovation. First, simplification of application procedures for funding programmes would enhance accessibility for resource-constrained SMEs. Standardized formats, online submission, and technical assistance with applications can reduce administrative burdens that disproportionately affect smaller firms. Second, programmes should be tailored to address the heterogeneous needs of SMEs across different sectors, sizes, and stages of development. One-size-fits-all approaches are unlikely to meet the diverse needs of the SME population.

Third, integration of funding with capability-building support, mentoring, and networking opportunities addresses the multiple barriers facing SMEs rather than focusing narrowly on financial constraints. Programmes such as Made Smarter, which combine technology advice, leadership development, and grant funding with networking opportunities, demonstrate the potential of integrated approaches. Fourth, support for industrial clustering and the development of innovation districts can leverage the benefits of geographical proximity for knowledge exchange and collaboration.

Fifth, attention to workforce development is essential for enabling SME participation in Industry 5.0. Programmes supporting skills development, leadership training, and talent attraction help address the human resource constraints that limit SME innovation capacity. Partnerships between SMEs and educational institutions, facilitated by policy support, can develop talent pipelines that benefit both parties.

Limitations and Future Research Directions

This study has several limitations that should be acknowledged. First, the reliance on published literature means that the synthesis reflects the foci and biases of existing research. Topics that have received limited research attention, such as SME innovation in developing country contexts or in specific industry sectors, are correspondingly underrepresented in the synthesis. Second, the restriction to English-language publications may exclude relevant research published in other languages, particularly from non-Anglophone contexts.

Third, the focus on peer-reviewed journal articles, while ensuring quality, excludes insights from practitioner literature, policy reports, and other sources that may contain valuable perspectives.

These limitations suggest directions for future research. First, longitudinal studies examining how SME innovation capabilities and practices evolve over time would complement the cross-sectional designs that dominate current research. Understanding innovation trajectories, the timing and sequencing of capability development, and the factors that distinguish successful from unsuccessful innovation journeys requires research designs that track SMEs over extended periods.

Second, comparative research across different national and regional contexts would illuminate how institutional environments, policy frameworks, and cultural factors shape SME innovation. The predominance of research from developed economies limits understanding of innovation in the contexts where most SMEs are located. Cross-cultural comparative studies, particularly those including developing and emerging economies, would contribute to more globally relevant knowledge.

Third, sector-specific research would reveal how industry characteristics, technological trajectories, and market structures shape innovation requirements and opportunities. The innovation challenges facing manufacturing SMEs differ from those facing service firms, knowledge-intensive businesses, or creative industries. Research that attends to these sectoral

differences would enable more targeted recommendations for practice and policy.

Fourth, research examining the integration of sustainability and digitalization imperatives, the twin transitions facing contemporary SMEs, would address an important gap in current understanding. How SMEs can simultaneously pursue digital transformation and sustainability innovation, and the synergies and trade-offs between these objectives, represents a critical question for both theory and practice.

Fifth, methodological innovation in SME innovation research would enhance the field's ability to address complex questions. Mixed-method designs combining quantitative analysis of innovation outcomes with qualitative exploration of innovation processes would provide richer understanding than either approach alone. Participatory research designs that engage SME managers as co-researchers would generate insights grounded in practitioner experience. Design science approaches that develop and test innovation management tools and techniques would contribute directly to practice.

Concluding Remarks

Innovation management in small and medium enterprises represents a domain of both theoretical significance and practical urgency. As the predominant form of business organization across global economies, SMEs collectively shape economic development, employment, and societal well-being. Their capacity to innovate determines not only their individual competitiveness but also the dynamism

and resilience of the economies in which they operate. Understanding how these enterprises can effectively manage innovation is therefore not merely an academic exercise but a contribution to economic and social progress.

The findings of this synthesis offer grounds for both optimism and concern. The optimism stems from evidence that SMEs can achieve significant innovation outcomes despite their resource constraints, leveraging flexibility, customer proximity, and collaborative relationships to compensate for limitations. The documented cases of successful digital transformation, the mechanisms of network-enhanced innovation, and the potential of well-designed policy support all demonstrate that SME innovation is achievable. The concern arises from the persistent barriers that constrain SME innovation capacity, the uneven distribution of innovation capabilities across regions and sectors, and the challenges posed by rapid technological and environmental change.

The path forward requires concerted effort from multiple stakeholders. SME managers must develop the strategic foresight, organizational capabilities, and collaborative relationships that enable innovation. Policymakers must design and implement support mechanisms that address the multiple barriers facing SMEs while avoiding the pitfalls of complex procedures and rigid eligibility criteria. Researchers must generate knowledge that illuminates the mechanisms of SME innovation and informs evidence-based practice and policy. Educators must develop curricula that prepare current and future SME managers for the innovation challenges they will face.

The integration of these efforts, within a shared understanding of the importance and complexity of SME innovation, offers the best hope for realizing the innovation potential of this vital sector. As the business environment continues to evolve, with technological acceleration, sustainability imperatives, and global uncertainties creating both challenges and opportunities, the capacity of SMEs to innovate will remain central to their survival and success. The synthesis presented in this paper, while inevitably incomplete, aims to contribute to the collective endeavor of understanding and enabling innovation in the enterprises that form the backbone of global economies.

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