

Digital innovation, digital transformation and operational performance: a thematic analysis

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Abstract

Purpose – The purpose of this systematic literature review is to extract and synthesize findings of research papers published in high-quality journals to address our specific research questions, find gaps and propose future research agendas. We want to understand the mechanisms by which digital innovation adoption (DIA) and digital transformation (DT) help small and medium enterprises (SMEs) achieve competitive advantage and enhance operational performance, ultimately leading to sustainable competitive advantage (SCA).

Design/methodology/approach – Fifty-nine studies were selected following the extended PRISMA guidelines as the methodological framework.

Findings – Four key themes have been generated based on thematic analysis of selected studies, which further helped us to find research gaps, implications and future research scopes.

Originality/value – DIA can enhance competitive advantage by business model innovation, strategic agility, resilience and foundational organizational capabilities in SMEs. Also, improve operational performance by process management, supply chain optimization and increasing employee productivity. Also, marketing orientation has been used as a complementary lens along with strategic and operational perspectives. The existing literature has not extensively addressed how these viewpoints can be integrated to create an SCA for SMEs. To address this gap, we developed an integrated conceptual framework with the help of key findings and propositions that emerged from the selected studies. We concluded the study by providing propositions for future empirical testing.

Keywords Digital innovation, Digital transformation, Sustainable competitive advantage, Operational performance, Small and medium enterprises (SMEs)

Paper type Research article

1. Introduction

It is quite volatile, uncertain, complex and ambiguous (VUCA) (Troise *et al.*, 2022) in the modern business setting. The recent formalization of Industry 4.0, along with the disruptive effects of artificial intelligence (AI) and the ongoing aftershock of the global seizures such as



the COVID-19 pandemic, only adds to this turbulence (Broccardo *et al.*, 2024a). Digital innovation adoption (DIA) can be determined as the methodical use of new digital technologies and approaches to products and operations to create value (Kohli and Melville, 2019). It has been shown by empirical evidence that digitally advanced small- and medium-sized enterprises (SMEs) are able to grow their businesses two times faster than less technologically advanced ones (McKinsey & Company, 2018). Digital technologies enable the optimization of resource distribution, decrease expenses and make data-driven decisions due to the ability to see ongoing processes in real-time (World Economic Forum, 2024).

SMEs are very important in international economic growth and in the natural ecosystems of innovation (Vincenza Ciasullo and Troisi, 2013). However, they often face the problem of resource and technology constraints (Ali and Waheed, 2025; Lepistö *et al.*, 2022; Hessels and Parker, 2013; Van Burg *et al.*, 2012). With the accelerating pace of digital transformation (DT), DIA is becoming a strategic need for operational efficiency and competitiveness of SMEs. There is no clear expository explanation of how DIA creates a sustainable competitive advantage (SCA) in extant literature. Although DIA is recognized to bring performance results, too much uncertainty still exists about its connection with strategic competitiveness and value creation over the long term (Ramdani *et al.*, 2022). It is important to fill this gap when dealing with SMEs operating in the context of highly dynamic environments. Similarly, the connection between the DIA and the market-facing capabilities like customer sensing, service personalization and demand-side intelligence has been neglected in the SME environment and is widely acknowledged as a key factor that brings SCAs (Wasim *et al.*, 2024; Puspaningrum, 2020).

The constellation of digital capabilities, human collaborative, technical and innovative as defined by Nasiri *et al.* (2023) is the foundation of the digital business processes of SMEs, and the organizational culture and the digital self-efficacy precondition them. Putting these capabilities as mediating variables will allow firms to promote better performance and innovation (Farida and Setiawan, 2022). However, the lack of qualified staff is a major challenge to the long-term competitiveness of such businesses (Škare *et al.*, 2023).

SMEs in emerging markets are using digital business model innovation as a strategic tool to enhance the flow of revenues and positioning in the market (Teoh *et al.*, 2023). Digital transformation (DT) not only provides these companies with the ability to manage uncertainty (Škare *et al.*, 2023) but also provides opportunities to achieve sustainable development (McKinsey & Company, 2018).

SMEs differ from large organizations, which have discrete business units, as they are characterized by heterogeneous organizational structure (Chen and Wu, 2005). In that regard, SMEs require an integrated framework. The available literature concerning DIA and competitive advantage is still scattered. In this study, empirical studies are systematically reviewed to summarize the existing body of knowledge and explain the strategic processes in which DIA enhances performance. This review proposes a conceptual framework that would make SMEs resourceful to overcome financial limitations and take maximum advantage of digital innovation by filling the existing gaps.

We explore the processes and ways in which DIA is related to both strategic advantage and operational performance, asking two main research questions:

- RQ1. What are the key mechanisms by which DIA enhances competitive advantage among SMEs?
- RQ2. What is the impact of the adoption of digital innovation on the firm's operational performance for SMEs?

For SMEs, the business path towards becoming digital is a cyclic process wherein strategic intent and operational implementation are inseparable. Digital capabilities mediate this association, and they include technical infrastructure as well as the soft skills of the labour force (Proksch *et al.*, 2024). These core strengths in operation cannot be done without strategic results, like business

model innovation. The idea of integration requires the ongoing ability building (Proksch *et al.*, 2024), in which SMEs build both strategic and operational digital capabilities simultaneously to obtain synergies and long-term impacts. This brings us to the last question:

RQ3. How do strategic competitiveness and operational performance output integrate and lead to yielding SCA in SMEs?

We performed the analysis of 59 studies according to the PRISMA recommendations (Page *et al.*, 2021) and formed four main themes. In this paper, our methodology has been described in Section 2, findings in Section 3, implications and gaps discussion in Section 4, conceptual frameworks in Section 5 and conclusions in Section 6.

This paper has three aspects that are novel and interrelated in comparing DIA and SME competitiveness. First, it offers a broad thematic analysis of 59 peer-reviewed studies that reveal the strategic and operational mechanisms that enable DIA to create competitive advantage and operational performance for SMEs. Also, it acknowledges marketing orientation as a complementary lens that integrates with the framework to yield SCA. Second, the authors present a novel conceptual framework for blending the DIA strategic and operational concepts to make explicit the circumstances in which DIA becomes a SCA, the relationship between dynamic capabilities theory (DCT) and operational performance mechanisms. Third, the paper proposes a structured future research agenda for the field, defining specific gaps, both as a function of time and as a function of contingencies and technology, with concrete propositions for testing in the empirical realm. These contributions collectively tackle the ongoing fragmentation of the DIA–SME literature and the need for a theoretically informed and practically useful starting point for pursuing further research.

2. Methodology

This chapter explains the research methodology using the Extended PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Guidelines, as suggested by Page *et al.* (2021), to ensure transparency, credibility and reproducibility. Using the 27-item checklist, this systematic literature review (SLR) will address research gaps and present a conceptual outline of the synthesized results.

The PRISMA framework was chosen for a few key reasons. It has become a globally accepted reporting standard for SLRs in management, information systems and the social sciences (Moher *et al.*, 2009; Page *et al.*, 2021). It offers a framework for identifying studies, screening, determining eligibility and the process of inclusion, which is replicable, transparent and repeatable, especially important when conducting a review that aims to synthesize highly diverse empirical evidence in heterogeneous contexts, as is done here. There have also been a few systematic review studies in related subject areas with a similar methodological way of proceeding that have used the PRISMA framework to achieve methodological rigor, such as digital innovation (Agazu and Kero, 2024; Ramdani *et al.*, 2022; Sun *et al.*, 2025), SME digitalization (Elkhoudary *et al.*, 2026; Yuwono *et al.*, 2024) and digital transformation performance (Song *et al.*, 2025; Bouwmans *et al.*, 2024). Bibliometric analysis and narrative review were considered but rejected due to limited applicability to the thematic synthesis of findings across different studies, methods and contexts. In the domain of business and management, PRISMA assists reviewers and editors in critical appraisal by documenting exactly what researchers chose to include or exclude, thereby reducing research waste and allowing for future review updates as digital technologies evolve (Mishra and Mishra, 2023). The comprehensiveness, transparency and analytical structure of PRISMA, therefore, are ideal to answer the research questions of this study.

2.1 Eligibility criteria

This section outlines the inclusion and exclusion criteria for paper selection, i.e., defines eligibility criteria. The author is expected to clarify all features employed as inclusion criteria

for studies, including the type of participants, interventions, outcomes and study designs (Moher *et al.*, 2009; Page *et al.*, 2021). The criteria for this SLR are outlined based on the research purpose, research questions and research objectives.

The following is a detailed list of inclusion criteria that guided our preparation of the SLR:

- (1) Peer-reviewed journal articles (Document and Source type) published between 2015 and 2025 (Publication year).
- (2) Papers written in English (language) and papers that are already published in journals (Publication Stage).
- (3) Papers belong only to the business, management, and accounting subject area.
- (4) Studies focusing on DIA, DT and digital orientation.
- (5) Studies focusing on specific digital technology adoption (focusing on Industry 4.0, AI, blockchain, cloud computing, the Internet of Things and digital twins).
- (6) Papers that are focused on SMEs are included.
- (7) High-quality, high-impact journals.

A detailed list of exclusion criteria that guided us as we prepared our SLR is as follows:

- (1) Non-peer-reviewed documents (e.g. reviews, conference papers, etc.) and source types (e.g. book series, trade journals, etc.).
- (2) Papers written in non-English languages.
- (3) Research papers that belong to different subject areas, rather than business, management and accounting.
- (4) Studies that do not specifically focus on DIA, DT and digital orientation.
- (5) Studies that concentrate on digital technologies beyond those specified in the inclusion criteria are also included.
- (6) Studies that are not focused on SMEs or not accessible in full-text format.
- (7) Low-quality research papers based on impact factors.

2.2 Information sources and search strategy

Open reporting involves a detailed account of the search process, such as the dates of the coverage as well as the date of the final search (Page *et al.*, 2021). After designing research objectives, we created a more organized strategy using advanced search capabilities. We performed independent exploration searches on the Scopus database (<https://www.scopus.com>) to identify relevant keywords related to DIA, competitive advantage and SMEs and to look up the literature. We came up with 33 context-specific keywords as shown in Table 1. Scopus was chosen in preference over other search engines such as Web of Science, Semantic Scholar and WorldCat because of its large interdisciplinary search coverage and higher relevance based on our focus on digital innovation in the context of SMEs.

To be unbiased, we used Boolean operators to combine terms “AND” and “OR”. Quality was achieved with boundary conditions that restricted the results to English peer-reviewed journal articles that have been published since 2016 and not older than 2025. The search process with the final search string is displayed in Figure A1 (see Appendix).

This was to be completed on August 25, 2025, to have a modern dataset. The PRISMA flow diagram (Figure 1) contains the selection process and the number of studies.

Table 1. Keywords used for systematic literature review (search performed on August 25, 2025, at www.scopus.com)

Digital innovation adoption	Competitive strategy	Small and medium enterprises
“Digital Innovation adoption*” or “Digital Innovation*” or “Digital technology adoption” or “Digital Transformation” or “Digital Orientation” or “AI” or “Industry 4.0” or “Cloud Computing” or “Blockchain” or “Internet of Things” or “Artificial Intelligence” or “Digital Twin” or “Diffusion of Innovation*” or “Innovation Diffusion”	“Competitive Strategy” or “Competitive Advantage” or “Strategic Competitiveness” or “Competitiveness” or “Digital Strategy” or “Strategic Management” or “Operational Performance” or “Sustainable Competitive Advantage” or “Productivity” or “Strategic Positioning” or “Business Strategy”	“Small and Medium Enterprise*” or “SME*” or “Small and Medium-Sized Enterprises” or “Smes” or “SMEs” or “Small and Medium Enterprises” or “Small-and-medium Enterprise*” or “Small to Medium-sized Enterprise*”
Source(s): Authors’ own work		

2.3 Study selection and screening process

During this stage, we concentrated on discovering and assembling primary studies associated with our research aims. According to [Page et al. \(2021\)](#) and [Moher et al. \(2009\)](#), the study selection process should be well defined, indicating the multi-stage process of screening, such as title and abstract screening and full-text eligibility. The search process involved five stages. First, the DIA-related keyword search produced 1,396,097 results. Second, the competitive strategy search yielded 9,827,439 records. Third, the SME-related keywords search generated 381,325 documents. In the fourth stage, we combined all three domains using the “AND” operator, which narrowed the results to 2,813 documents. In the fifth stage, we applied limiting parameters and hence reduced the number of papers to 495.

The PRISMA Framework was used to select and screen papers. The flowchart of the selection and screening process is displayed in [Figure 1](#). The stages consist of identification, screening, eligibility and inclusion. An initial screening was performed based on the quality of the journals and obvious irrelevance, which significantly reduced the number of articles to 158 from 495. Then, after reading the titles and abstracts of the papers in detail, another 68 articles were excluded depending on the relevance of the study, resulting in 90 articles. Finally, a full-text review of our research objectives and questions excluded 31 additional papers, resulting in 59 articles for our literature review.

2.4 Data collection and data extraction

After selecting the final list of papers, we downloaded the list from Scopus into an Excel spreadsheet, which contained the title, abstract, DOI, link, author details, citations, publication year and other relevant information. We manually extracted data from each of the 59 papers using a Microsoft Excel spreadsheet, which includes theory, key findings, context, characteristics, methodology used, limitations and future research scope.

2.5 Quality assessment

The entire list of included studies is considered peer-reviewed articles published in Scopus-indexed, high-quality and high-impact journals, which means that the academic quality criteria are followed.

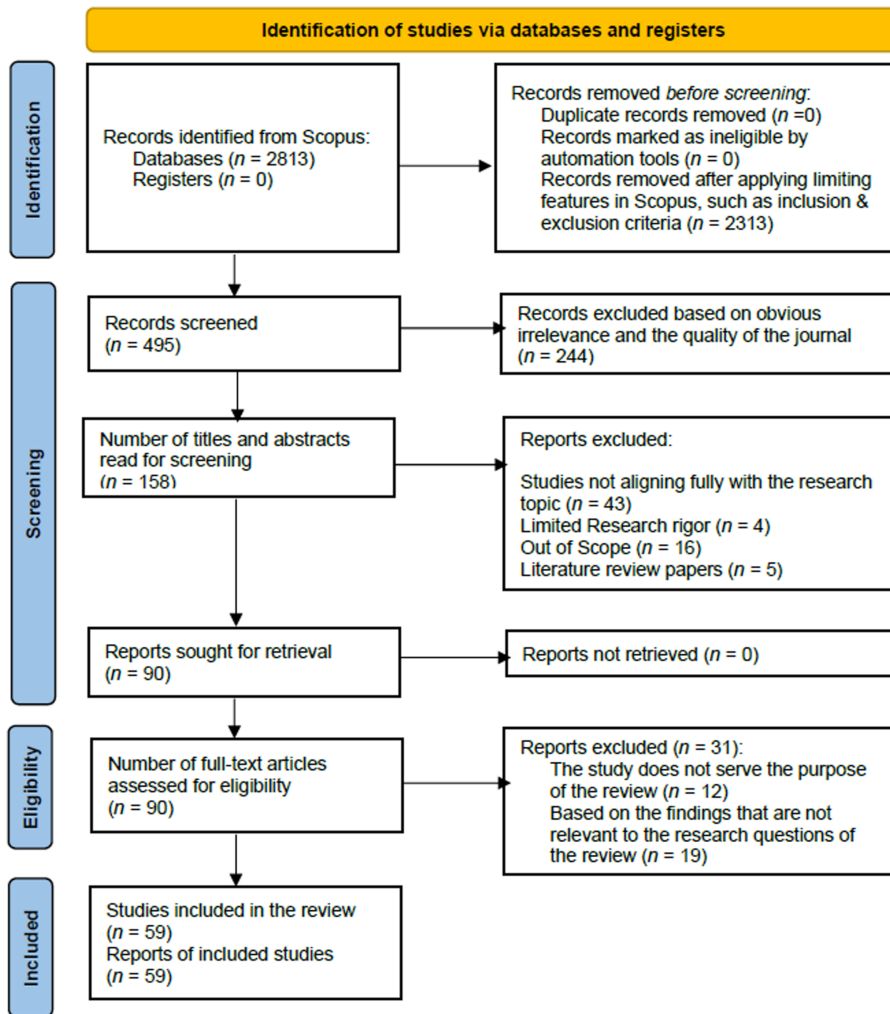


Figure 1. PRISMA flowchart. Source: Authors' own work

2.6 Data synthesis and analysis plan

The last part of the methodology section is the description of the data synthesis process used. It may include qualitative synthesis, quantitative meta-analysis or both, depending on the characteristics of the studies and data (Page *et al.*, 2021). Although a meta-analysis may be used in some reviews to combine effect estimates, most SLRs, especially in the social sciences, use a qualitative or thematic method (Roy Bhattacharjee *et al.*, 2022; Page *et al.*, 2021). We did data synthesis manually with the help of thematic content analysis, which is a type of qualitative data analysis technique (Braun and Clarke, 2006).

3. Findings

The data extraction process for the selected papers focused on synthesizing key findings, methodologies and the various theories employed. Following this, a qualitative thematic

analysis was performed on the findings of each paper to identify emerging sub-themes. Finally, these sub-themes were clustered into four primary themes, as shown in [Table 2](#).

3.1 Qualitative thematic analysis

The scholarly literature indicates that the question of DIA in SMEs is complex and multifaceted. A set of interconnected themes has been discovered through a rigorous procedure of qualitative content analysis, and each of them sheds light on a specific aspect of the DT process.

3.1.1 *The human and leadership-focused facilitators of digital innovation adoption.* Digital transformation is not a technical endeavour but a larger organizational and human transformation process ([Romero, 2025](#); [Jang et al., 2022](#)). The necessity of leadership in driving this change is highlighted in several articles ([Romero, 2025](#); [Malodia et al., 2023](#)). To provide an example, a study that concentrated on the phenomenon of Ghanaian small- and medium-sized businesses found a positive correlation between digital transformation and digital transformational leadership, stating that the existence of strong leadership improves information technology infrastructure and the digital capabilities of employees ([Gyamerah et al., 2025](#)). Besides, companies with professional leadership are more likely to achieve high results during their digital paths ([Malodia et al., 2023](#)). The strategic vision and resource allocation needed to develop the digital capabilities crucial to successful change are provided by effective leadership ([Gyamerah et al., 2025](#)). Digital transformation is a process with multiple stages, where visionary leadership promotes investment in human capital and institutional support to promote the development of digital capabilities and the following increase in performance ([Lathabhavan and Kuppusamy, 2024](#)).

One of the most interesting aspects of this anthropocentric approach is paradoxical leadership in the Industry 4.0 scenario ([Hossain et al., 2024](#); [Trieu et al., 2024](#)). In dynamic environments, leaders must strike a balance between stability and change, between exploitation, which can be defined as optimising extant processes, and exploration, which is defined as searching for new opportunities ([Hossain et al., 2024](#)). The ability to balance between these conflicting needs is the precondition for an organization developing a lasting digital advantage ([Hossain et al., 2024](#); [Trieu et al., 2024](#)).

Table 2. Qualitative thematic analysis

Thematic cluster	Sub-themes/concepts	Supporting literature
1. Human and Leadership-Centric Enablers	Leadership, Entrepreneurial Orientation, Digital Self-Efficacy, Human Capital, Digital Skills	Gyamerah et al. (2025) , Malodia et al. (2023) , Satar et al. (2025) , Romero (2025) , Lathabhavan and Kuppusamy (2024) , Hossain et al. (2024) , Trieu et al. (2024) , Jang et al. (2022)
2. Foundational Organizational Capabilities and Readiness	Dynamic Capabilities, Organizational Agility, Resilience, Business Model Innovation, Organizational Ambidexterity	Saeedikiya et al. (2024) , Shore et al. (2024) , Sinha et al. (2024) , Merin-Rodríguez et al. (2024) , Liu et al. (2024) , Hossain et al. (2024) , Trieu et al. (2024) , Troise et al. (2022)
3. Contextual Influences and External Forces	Government Policy, External Support, Digital Ecosystem, Competitive Pressures, Geographic Context	Mai et al. (2024) , Ietto et al. (2022) , Boakye et al. (2024) , Shetty and Panda (2023) , Khayer et al. (2021)
4. Technology-Specific Challenges and Opportunities	AI Adoption, Cloud Adoption, Blockchain, Lean Digitalization, Process Management, Manufacturing vs Service Sector	Cooper (2025) , Rajaram and Tinguely (2024) , Alshaheer et al. (2025) , Wong et al. (2024) , Broccardo et al. (2024b) , Škare et al. (2023)

Source(s): Authors' own work

3.1.2 Fundamental organizational competencies and readiness. The application of technology alone cannot produce a competitive advantage, but the key aspect lies in the already existing organizational potential of firms to utilize that technology (Chakraborty *et al.*, 2025; Jam *et al.*, 2025; Trieu *et al.*, 2024). Dynamic capabilities (DCs) provide a conceptual framework to explain this phenomenon, which states that the ability of the firm to integrate and reconfigure capabilities is critical to managing the turbulent changes in the environment (Gyamerah *et al.*, 2025; Saeedikiya *et al.*, 2024). Empirical research studies focusing on the implementation of AI emphasize the idea that SMEs should plan the resources, obtaining and assembling AI functions into the learning and governance functions (Peretz-Andersson *et al.*, 2024; Denicolai *et al.*, 2021).

3.1.3 Contextual influences and external forces. Internal capabilities and leadership, while necessary, are not sufficient to ensure successful digital transformation unless the broader ecosystem is also supportive (Mai *et al.*, 2024; Trieu *et al.*, 2024). In the case of developing economies, the intervention of government policies and incentives is critical; here, the Vietnamese SMEs enjoy the advantage of receiving direct boosting its IT potential (Mai *et al.*, 2024; Mukherjee *et al.*, 2024). Furthermore, the help of competence centres and universities is a vital source for SMEs that do not have sufficient resources internally (Ietto *et al.*, 2022).

The contextual factors, including geographic location and market maturity, have a strong impact on the adoption patterns (Mai *et al.*, 2024; Boakye *et al.*, 2024; Shetty and Panda, 2023). Interestingly, the market forces had no great impact on the willingness to implement blockchain technology amongst Ghanaian SMEs (Boakye *et al.*, 2024). This is unlike the utilization of cloud computing, where competitive pressure is one of the key factors in use (Wang *et al.*, 2025; Khayer *et al.*, 2021; Al-Shboul, 2019). The external forces seem to be less influential in the market than the internal forces of immature technology markets and the intended value that it holds.

3.1.4 Navigating technological challenges and opportunities. The results about the determinants of technology as well as the barriers to the latter are often dependent on the specific technological field (Cooper, 2025; Mukherjee *et al.*, 2024; Pappas *et al.*, 2021). Even though the widespread adoption of AI is hindered by enormous financial costs, cybersecurity risks and the lack of awareness (Cooper, 2025), this technology will offer a strong competitive edge to firms in the long term (Rajaram and Tinguely, 2024). The available literature supports the idea that the scope and subtleties of awareness of AI implementation among SMEs have not been studied deeply yet (Peretz-Andersson *et al.*, 2024; Khan *et al.*, 2024).

On the contrary, more established technological solutions, like cloud computing, are preferred on the grounds of the proximate payoff mechanisms, i.e. the perceived utility and mitigation of transactional spending (Shetty and Panda, 2023; Khayer *et al.*, 2021; Cleary and Quinn, 2016). This indicates that SMEs are becoming bifurcated as organizational units are focusing on digital innovations, which provide immediate operational payoffs rather than those with strategic long-term payoffs.

Process management is one of the key mediating objectives in the effective implementation of Industry 4.0 projects, which acts as the impulse of strategic change and more competitive capabilities (Thekkoote, 2025; Kahveci *et al.*, 2024). Empirical data show that the general digitalization process of organizational processes is a relevant performance-enhancing condition (Broccardo *et al.*, 2024a). However, the real competitive advantage source lies in how an enterprise reorganizes its main operating processes, as well as intellectual capital, in relation to digital tools (Broccardo *et al.*, 2024b).

4. Discussion

This section answers the research questions posed at the beginning of this review based on the findings from the previous section.

4.1 Addressing the research questions

RQ1. What are the key mechanisms through which DIA enables competitive advantages for SMEs? (Strategic viewpoint).

Strategically, digital innovation offers a competitive edge to the organization as it allows the company to adapt, differentiate and innovate. The strategic potential and organizational changes that technology brings about are the primary drivers, as opposed to the technologies. To illustrate this, the readiness for AI has been reported to have a positive impact on global performance (Denicolai *et al.*, 2021) and the performance of SMEs in terms of innovation (Carayannis *et al.*, 2024). The literature shows that, contrary to the popular opinion that DIA is about technology acquisition, it is a causal chain. An organizational capability (agility, resilience, ambidexterity) is developed as a result of digital investment, which then leads to strategic outcomes (business model innovation, repositioning the business, cost differentiation), which ultimately create SCA when integrated into routines that are hard to imitate (Teece *et al.*, 1997; Barney, 1991). Three policy levers on which this logic is played out are elaborated below.

4.1.1 Business model innovation. Digital transformation provides an innovation roadmap to a developing SME that can boost its performance by applying new value-creating models. Strategic value can't be realized until an organization is ready to reinvent the value proposition and target customers as well as revenue streams, but not just digitize the existing processes (Merin-Rodrig   ez *et al.*, 2024). Knowledge sharing is an aspect of digital capabilities that can indirectly stimulate SME internationalization via BMI, hence providing access to stable global markets (Anwar *et al.*, 2022).

In addition to process redesign within the enterprise, DIA fortifies the market-oriented aspects of business model innovation. Digital tools help SMEs to create and share market intelligence more efficiently, as outlined by Kohli and Jaworski (1990) as the three key business functions of a market-oriented organization, such as intelligence generation, cross-functional dissemination and organization-wide responsiveness. For example, SMEs can use customer relationship management (CRM) systems and digital analytics platforms to identify and adapt in real time to their customers' preferences and to respond quickly to the changes in demand (Narver and Slater, 1990). Particularly, Wasim *et al.* (2024) discovered that market orientation combines the use of digital tools related to the Internet of Things (IoTs) to enhance SME performance, mediated by creativity. These market-facing skills augment internal efficiency gains and will be key for DIA to become a commercially viable and customer-relevant competitive advantage.

4.1.2 Strategic agility and resilience. Digital innovation is one of the key drivers of organizational agility and resilience in uncertain market conditions (Sinha *et al.*, 2024; Troise *et al.*, 2022). The potential of digital technology can guide SMEs to predict and act quickly in response to external perturbations (Trieu *et al.*, 2024; Siahaan and Tan, 2022; Troise *et al.*, 2022). Although digitalization has a direct impact on crisis resilience, its implementation is not thorough enough to build strong adaptive capacity (Sinha *et al.*, 2024). According to Fabian *et al.* (2024), radical orientation and organizational rigidity determine whether digitalization enhances firm performance. However, strategic agility also reinforces entrepreneurial orientation in the framework of digital transformation (Satar *et al.*, 2025; Siahaan and Tan, 2022).

4.1.3 Organizational ambidexterity and strategic fit. Digital transformation enhances the ability of an SME to meet the demands of the business as well as enhances business competitiveness (  kare *et al.*, 2023). The use of Industry 4.0 suggests process administration to enable strategic improvement, competitiveness and alignment (Kahveci *et al.*, 2024). In addition, the application of Industry 4.0 technologies fosters the purpose of exploratory and exploitative (Chaudhuri *et al.*, 2022) activities, which are fundamental components of organizational ambidexterity and the sustainable competitive edge (Hossain *et al.*, 2024; Teece *et al.*, 1997). Although these results have been attained, there is still a gap in the way the mechanisms are causal, especially in different strategic contexts, including cost leadership vs differentiation strategies.

It is important to note that there is a difference between a temporary and SCA. DIA has a sustainable advantage when the capabilities that it produces are rare, inimitable and non-substitutable (Barney, 1991). For instance, while cloud adoption cuts costs, such a change is easily replicable, so if it is a source of cost savings, it is not a competitive differentiator. Conversely, newly established business models based on novel digital features, the establishment of data assets built around a unique set of data, or the acquisition of ambidextrous digital leadership give the company an advantage that is difficult to duplicate (Hossain *et al.*, 2024; Teece *et al.*, 1997). Practically, this means that rather than just adopting a digital tool, it is how that tool is embedded in the firm's processes, culture and knowledge structure that determines the sustainability of competitive advantage for SMEs.

RQ2. What is the impact of the adoption of digital innovation on the firm's operational performance for SMEs? (Operational viewpoint).

Besides the advantages of strategy, DIA has effects on the daily performance of SMEs by helping them be more efficient, productive and risk-averse (Wong *et al.*, 2024; Hong *et al.*, 2021).

4.1.4 Process management and optimization. Industry 4.0 technologies are proven to be empirically associated with high increases in labour productivity (Bettiol *et al.*, 2024). The readiness for Industry 4.0 serves as the mediator between strategic orientations and the SCA (Ed-Dafali *et al.*, 2023). Research on Italian SMEs indicates that digitalization affects the increase in labour productivity by 7% (Bettiol *et al.*, 2024) and speeds up workflow (Broccardo *et al.*, 2024a).

4.1.5 Supply chain optimization. Supply chain optimization is the key to the use of digital technologies (Jam *et al.*, 2025). Supply chain management (SCM) implementation mainly affects innovation and performance through enhanced information sharing and visibility (Jam *et al.*, 2025; Wong *et al.*, 2024; Ed-Dafali *et al.*, 2023).

4.1.6 Resilience, cost reduction and internal process improvement. Digitalization provides benefits to internal processes and cost reductions (Broccardo *et al.*, 2024b; Cleary and Quinn, 2016). Accounting infrastructure provided in the cloud has a positive impact on human and relational capital, resulting in improved performance (Cleary and Quinn, 2016). Furthermore, employee burnout can be reduced with the help of new technologies, such as the Cloud of Things, and the performance of a circular economy can be improved with the help of AI-based reverse logistics (Alshaher *et al.*, 2025; Mukherjee *et al.*, 2024).

Right now, the studies remain very isolated and usually target specific technologies (e.g. IoT or Cloud ERP) instead of the overall effect of a multi-faceted DT on operations (Pappas *et al.*, 2021; Al-Shboul, 2019).

RQ3. How do strategic competitiveness and operational performance output integrate and lead to yielding SCA in SMEs?

A combination of a strategic and operational perspective forms the most crucial aspect of achieving SCA. An increase in efficiency is not enough, but it must be handled in a strategic way to create new business models and create long-term value.

4.1.7 Two viewpoints: strategic and operational. Yu *et al.* (2022) distinguish between operational and strategic forms of digital transformation, each with distinct performance implications. The empirical study of ESG performance reveals that operational and digital resources have an influence on market performance, which is mediated by an intermediate variable, e.g. firm competitiveness (Wang and Esperanca, 2023).

4.1.8 Integrated framework to yield sustainable competitive advantage. Only under the condition of purposeful exploitation of operational gains in productivity do they generate resources that enable innovation, the development of flexible cultures and what is inimitable in a business model (Liu *et al.*, 2024). The models of the interaction between strategic digital leadership and operational organizational preparedness, as proposed in the framework, establish DCs and innovations in the digital business models that, on the one hand, lead to growth in performance and, on the other hand, to SCA.

Completing this integration here requires also embedding operational and strategic benefits of DIA into greater market orientation, such as more in-depth customer intelligence, more competitive responsiveness and more agile value proposition management. SMEs with both the capabilities of internal capacity development as well as market-facing digital capability are more likely to be able to sustain their competitive advantage compared to those that tend to concentrate on operational efficiency solely (Wasim *et al.*, 2024; Narver and Slater, 1990).

4.2 Research gaps and future agenda

Although the current literature offers a solid framework on the topic of adopting digital innovation in SMEs, a critical analysis suggests that there are some gaps that should be explored in the future.

4.2.1 Longitudinal analysis of non-linear relationships. Current linear theories about digital adoption and performance are coming under increasing scrutiny of the empirical evidence. However, several studies indicate that this association is not linear, but rather U-shaped (Barragan and Becker, 2025) or curvilinear (Shore *et al.*, 2024). This phenomenon has been described often in industry circles as the “digital valley of death,” which is the performance dip that happens when companies either invest in new digital skills or embark on new digital ventures but have yet to restructure organizational processes, routines and human capital to take full advantage of those new capacities. This is a transition period and the costs of adoption. Existing lineal assumptions on the correlation between digital adoption and performance often cannot be heeded. Empirical evidence indicates that the relationship between the two patterns is of the U-shaped or curvilinear form (Barragan and Becker, 2025; Shore *et al.*, 2024). Most current research only reflects a single cross-section in time, leading to misperceptions about the absence or negative nature of DIA’s impact when done in the trough and a misperception of the positive direct impact when done post-recovery. Future research should thus take a longitudinal perspective, either in the form of a time-series or a panel data approach, to be able to follow the performance of firms through different stages of the adoption process. Researchers could use such designs to establish threshold levels at which investment starts to yield positive results, understand the nature of the recovery process based on the responses of various firms and understand what the recovery process consists of, for these texts. Specifically, the path of an additional mediating variable, organizational ambidexterity and its time-sensitive and path-dependent nature according to the theory of Trieu *et al.* (2024) and Hossain *et al.* (2024) could be tested longitudinally between DIA and performance. Priority outcomes to be monitored over time should be defined with the broader scope of the outcomes to encompass market responsiveness, innovation output, customer retention and supply chain resilience.

4.2.2 Elaboration of the role played by human and organizational factors. Existing literature lacks detail on how digital leadership translates individual and organizational competencies into measurable outcomes and results (Gyamerah *et al.*, 2025; Malodia *et al.*, 2023). Considering the theoretical importance of paradoxical leadership in organizational ambidexterity, future research should also include paradoxical leadership as a moderator between DCs and SCA. The process of employee empowerment and training should be treated as a mediator between technology adoption and operational outcomes, especially regarding implementing AI and Industry 4.0 technologies in SMEs. To obtain a holistic understanding of the impact of DIA on the performance of the SMEs, additional dependent variables in the model must include aspects other than productivity, such as customer satisfaction, service quality, innovation rates and even employee retention (Bettiol *et al.*, 2024; Lathabhavan and Kuppusamy, 2024).

4.2.3 Improving measurement models and methodologies. The need for modern, real-time measurement models, which could replace the traditional cross-sectional approach, is clearly there (Buitrago *et al.*, 2025). Incorporating AI analysis or mixed-method designs based on the unstructured information could provide a more in-depth evaluation of the digital performance (Scuotto *et al.*, 2021).

4.2.4 Technology-specific and sector-specific analysis. Industry 4.0, cloud computing and IoT are well-documented (Khayer *et al.*, 2021; Pappas *et al.*, 2021; Moeuf *et al.*, 2020), but there is a substantial gap in the research on newer technologies. Future studies should focus on sector-specific and localized views to equip SMEs with specific knowledge of the distinctive problems of digital innovations (Trieu *et al.*, 2024; Lathabhavan and Kuppusamy, 2024; Malodia *et al.*, 2023). Pappas *et al.* (2021) emphasize the idea that the relevance of digital solutions cannot be applied equally to various industries. The motivators for AI implementation in the manufacturing industry might be quite different from those in the service industry (Baabdullah *et al.*, 2021). Similarly, the effects of a given technology, including the IoT, have not been extensively examined in a single developing nation (Alshaher *et al.*, 2025).

4.2.5 Comparative and contingency-based studies because of contextual differences. Comparable data about extrinsic variables, including government policy and competition pressure, point to the necessity of comparative studies (Boakye *et al.*, 2024; Mai *et al.*, 2024). Although a wealth of SME literature has been established across developed and developing economies, there are practically no cross-geopolitical comparisons (Lathabhavan and Kuppusamy, 2024). Although a large body of literature on SMEs exists in developed economies (e.g. Italy, Germany, Spain, etc) and even some developing economies (e.g. India, China, Vietnam, etc), comparative literature across geopolitical settings does not exist (Lathabhavan and Kuppusamy, 2024). The studies on AI (Baabdullah *et al.*, 2021) and Blockchain adoption (Boakye *et al.*, 2024) in Saudi Arabia and Ghana, respectively, show that the two factors and their obstacles can be very localized to the market and competitive forces, as well as the regulatory conditions. The subsequent studies should be a cross-regional or cross-cultural design to identify what exactly the circumstances are in which these factors play a role (Mai *et al.*, 2024).

4.2.6 Market orientation as a mediating and moderating variable. The current review focuses solely on the strategic and operational aspects of DIA. But Wasim *et al.* (2024) reveal that market orientation is a moderator between digital tools and the performance of SMEs, while the IoT is a moderator, and creativity is a mediator. This finding highlighted the need for more research on the mediating and moderating role of market orientation, defined as the organization-wide generation and responsiveness to market intelligence (Kohli and Jaworski, 1990), between DIA and the SCA in SMEs. Specifically, research needs to examine if SMEs that have a higher degree of market orientation obtain more and lasting competitive value from the implementation of digital innovation, and if the use of digital tools can speed up the strengthening of market orientation as an organizational capability (Kumar *et al.*, 2011). For the above research agenda, a survey-based or multi-case longitudinal design would be suitable that encompasses firms in different sectors that have different digital maturity and market orientation (Kohli and Jaworski, 1990; Narver and Slater, 1990).

4.3 Implications and future strategic roadmap

The discussion provides deep conclusions on the organizational practice, policy formulation and the way forward on the study of SME digitalization. Success means a long-term approach, in which a strategy is implemented to look at both technological contributions and organizational outputs.

4.3.1 Managerial and organizational implications (actionable strategies for SME managers). Several implications for managers and organizations in the application of the various theories in the study follow:

The conclusions of this review result in a series of recommendations for the owner, operational managers and HR managers of an SME. To enhance usability, these are grouped according to audience and time horizon.

4.3.1.1 For SME owners and senior managers (immediate action). They should make sure that virtual investments do not fail to perform in the earlier stages. Data suggest ROI could be

negative, then positive, on digital investments, with a learning curve of one to three years (Barragan and Becker, 2025). Since both AI and IoT solutions are costly, investing in low-risk options like cloud-based accounting or ERP systems first to help achieve quick operational wins and develop organizational confidence in these technologies before committing to high-tech solutions (Alshaher *et al.*, 2025; Cooper, 2025).

Change is not about a technology purchase, but it is also about process change. Strategic value can only be generated by DIA when part of the revised business processes and the updated value propositions (Jam *et al.*, 2025; Kahveci *et al.*, 2024; Merín-Rodríguez *et al.*, 2024). This means that every significant digital investment should be accompanied by a deliberate review of at least one core process or revenue stream. The aim should be to create something that competitors cannot easily replicate (Teece *et al.*, 1997; Barney, 1991). Business model innovation, rather than process digitization, is where DIA creates a durable competitive advantage (Liu *et al.*, 2024; Anwar *et al.*, 2022). As an owner's requirement, every investment in digital needs to be accompanied by a documented change of at least one of the fundamental processes or revenue streams; it is not just a tool upgrade.

4.3.1.2 For SME owners and senior managers (medium-term strategic action). Owners and managers should customize revenue-generating models as the key strategy of digitalization. The value propositions or the target customer segments of SMEs, or even the revenue channels, would shift to generate more SCAs, as seen from the evidence here (Liu *et al.*, 2024; Rajaram and Tinguely, 2024; Anwar *et al.*, 2022). The digital business model should be reviewed in a structured way at least every two years as part of the medium-term plan.

Develop digital market intelligence capacities and operational enhancements. Digital tools equip SMEs with the capability to quickly react to market signals, gain insight into customer preferences, and monitor competitor activity (Wasim *et al.*, 2024; Kohli and Jaworski, 1990). Market-facing competitive advantage will not come from investing in CRM systems, digital analytics dashboards or customer feedback platforms; it will come from the ability to reap a profit from them.

4.3.1.3 For operational and working managers. It's necessary to pay attention to leadership and governance in parallel. Managers must make digital governance more than just the owners. To support digital maturity, it is necessary to decentralize digital tools and process governance into multiple functional areas, not just the area that owns them or has a single IT function (Romero, 2025). Managers need the decision-making authority and capability in their departments for digital. Functional managers with visible top manager commitment can help build digital maturity in the SME, instead of in small islands of the organization (Chakraborty *et al.*, 2025; Khayer *et al.*, 2021). This also applies to the concept of paradoxical leadership, which suggests that managers in digital transformation situations must tackle the optimization of existing processes and the pursuit of new digital possibilities at the same time, a skill that is acquired as an organizational ability and not just an individual attribute (Hossain *et al.*, 2024; Trieu *et al.*, 2024).

4.3.1.4 For HR managers and learning-development leaders. HR managers should not let the digital talent shortage limit competitive advantage. The lack of talent is reported as one of the main threats to long-term digital competitiveness in the literature reviewed (Moeuf *et al.*, 2020; Broccardo *et al.*, 2024a). Companies need to create competency frameworks that align digital skills with specific business goals, not give technology training in general. Learning and development leaders must invest heavily in the training of their employees on digital skills and drive the process beyond IT literacy levels to focus on specific skills that will support the use of tools based on AI (Broccardo *et al.*, 2024a, b; Trieu *et al.*, 2024; Scuotto *et al.*, 2021). Human resource practices should also actively promote ambidexterity among staff, that is, creating the capacity of the existing personnel to perform existing tasks (exploitation) while promoting experimentation with new digital HR methods (exploration) (Trieu *et al.*, 2024). Programs should not only include IT skills but also specific skills that relate to the firm's digital tools (Trieu *et al.*, 2024; Chaudhuri *et al.*, 2022).

4.3.2 Policy and ecosystem implications (recommendations for government and support institutions).

4.3.2.1 Policy interest: raising beyond generic financial grants. The authorities in policy must no longer use generic monetary assistance for hardware. The areas that should receive subsidies include human capital development, strategic guidance and ecosystem development (Letto *et al.*, 2022; Khayer *et al.*, 2021). The long-standing managerial shortage or skill identified as a primary risk cannot be resolved only with the help of financial stimuli (Moeuf *et al.*, 2020). The policy should contribute to the development of absorptive capacity and formal processes by SMEs (Romero, 2025).

4.3.2.2 Reducing financial and operating risk. There should be promotion of transparent digital infrastructure, including cloud-based accounting, to ease restrictions in financing (Wang *et al.*, 2023). To enable SMEs to be able to experiment with advanced technologies (e.g. I4.0) at low initial cost and risk, governments should provide funding to these partnerships between the public and the private sector in terms of R&D (Letto *et al.*, 2022).

4.3.2.3 Contextual and heterogeneity-sensitive policy design. Multi-criteria decision-making (MCDM) models should be used to design the support policies in accordance with industry and maturity (Hong *et al.*, 2021). The support should be aware of the barriers present in spheres, like difficulties with the introduction of IoT in trading (Pappas *et al.*, 2021). The recognition of the contingency of I4.0 success (Jang *et al.*, 2022) and the mixed popularity of its drivers in the developing world (Shetty and Panda, 2023) allows the maximization of the payback of the public investment through tactical focus.

In addition to all the above, policy design should draw on the latest theory and empirical research in the DIA field. The literature suggests that there are many policy-relevant mechanisms that are not fully exploited in the current support frameworks. Policymakers must first match the support instruments with the technology life cycle and the adoption stage of targeted companies. While early adopters benefit from support for access to cloud-based infrastructure and process digitalization tools, more mature SMEs can benefit from support in adopting AI, implementing digital twins and introducing platform-based business model innovation (Cooper, 2025; Rajaram and Tinguely, 2024). Second, from the DCs' perspective (Teece *et al.*, 1997), one should encourage SMEs to have the competence of sensing, seizing and reconfiguring resources through structured mentoring programmes, peer-learning networks and competence centre partnerships (Letto *et al.*, 2022). Thirdly, as per the ambidexterity in organizational literature discussed above (Trieu *et al.*, 2024; Hossain *et al.*, 2024), support policies should emphasize the simultaneous investment in exploitative digital efficiency improvements and explorative digital innovation pathways instead of considering them conflicting. Finally, gender and age diversity in SME digital leadership has been identified as a cross-cutting theme in digital performance outcomes; policies that invest in diversifying the leadership pipeline will have multiplicative benefits on the adoption and capability side of digital.

5. Conceptual framework

This section first justifies the theories that have been used to develop a conceptual framework with the help of the findings and gaps from the existing literature.

5.1 Underlying theories and key lessons

Based on the abundance of research on DIA and competitive advantage within the SMEs, a few of its core lessons are drawn that correspond to the existing theories. These are the technology acceptance model (TAM) (Davis, 1989), the diffusion of innovations theory (DIT) (Rogers, 1962), the resource-based view (RBV) (Barney, 1991), the DCT (Teece *et al.*, 1997), technology-organization-environment (TOE) framework (Tornatzky and Fleischer, 1990), unified theory acceptance and use of technology (UTAUT) (Venkatesh *et al.*, 2003) and the absorptive capacity theory (Cohen and Levinthal, 1990). These multiple theoretical

frameworks are used to conduct the analysis of complex links between technology, organization and performance in SMEs and provide a specific point of view.

As noted above, the UTAUT model refers to the original UTAUT model (Venkatesh *et al.*, 2003), which is more commonly used in organizational and B2B contexts, such as in SME digital technology adoption in the supply chain and enterprise systems, and UTAUT2 (Venkatesh *et al.*, 2012) accommodates the introduction of hedonic motivation and habit constructs in consumer contexts. Both variants are applicable for the DIA domain: UTAUT is used for the studies investigating the leadership-driven and organizational adoption antecedents, and UTAUT2 better reflects individual-level and customer-facing digital adoption behaviours in SMEs.

This review utilizes market orientation theory implemented by Kohli and Jaworski (1990) and by Narver and Slater (1990) to consider the market-focused component of competitive advantage. Although strategic and operational aspects of DIA are the subject of the major focus of this review, market orientation is recognized here as a complementary approach, in relation to the role of digital tools in customer sensing, dissemination of intelligence and response in SMEs.

Although alignments to existing models can be found, there are considerable gaps that show that existing models might be shortcomings when it comes to comprehending the long-term competitive advantage of DIA in SMEs. RBV offers a general description of competitive advantage, presupposing that the primary factor of success is internal, valuable, inimitable, rare and non-substitutable resources (Jam *et al.*, 2025; Wang *et al.*, 2025; Wasim *et al.*, 2024; Ed-Dafali *et al.*, 2023; Estensoro *et al.*, 2022; Jang *et al.*, 2022; Siahaan and Tan, 2022). RBV explains the reason why digital assets and human capital leverage performance (Romero, 2025; Trieu *et al.*, 2024). Nonetheless, the traditional RBV does not allow explaining the success of companies in the rapidly changing digital world.

DCT plays a significant role in explaining the way in which a firm re-architects digital resources as a response to market changes (Chakraborty *et al.*, 2025; Saeedikiya *et al.*, 2024). These are the effects of digital transformational leadership (Gyamerah *et al.*, 2025) and the application of generative AI as DCs to establish resilience (Shore *et al.*, 2024). Other lenses are DIT (Alshaher *et al.*, 2025; Carayannis *et al.*, 2024; Hassan *et al.*, 2024), organizational learning theory (Romero, 2025) and contingency theory (Jang *et al.*, 2022). TOE, TAM and UTAUT explain the antecedents of the process of adoption (Jam *et al.*, 2025; Chakraborty *et al.*, 2025; Zheng *et al.*, 2024), although the former framework can be seen as an integrative model that helps identify the conditions under which the DCT process occurs (Wang *et al.*, 2023; Hong *et al.*, 2021). Therefore, an integrated DCT-TOE lens can be a useful model to actualize the operations of DIA to enhance the long-term competitive leverage in SMEs.

5.2 Propositions and framework

Two conceptual frames are first developed, i.e. strategic and operational. Finally, they are combined into a single model as illustrated in Figure 2.

5.2.1 Strategic viewpoint – framework. It is a framework founded on DCT that demonstrates how DIA transforms the strategic position of an SME (Merín-Rodríguez *et al.*, 2024; Sinha *et al.*, 2024) and creates a competitive advantage over time (Trieu *et al.*, 2024). The first step is investment in digital technologies, yet investment is not enough to attain success (Jam *et al.*, 2025). The value of digital investment is realized when it is combined with organizational capabilities (Scuotto *et al.*, 2021), namely, agility (Troise *et al.*, 2022) and resilience (Sinha *et al.*, 2024), which lead to strategic outcomes (Trieu *et al.*, 2024). This whole process is moderated by critical human factors, including visionary leadership (Gyamerah *et al.*, 2025).

Propositions for empirical testing are as follows:

P1: DIA positively influences strategic outcomes through organizational capability.

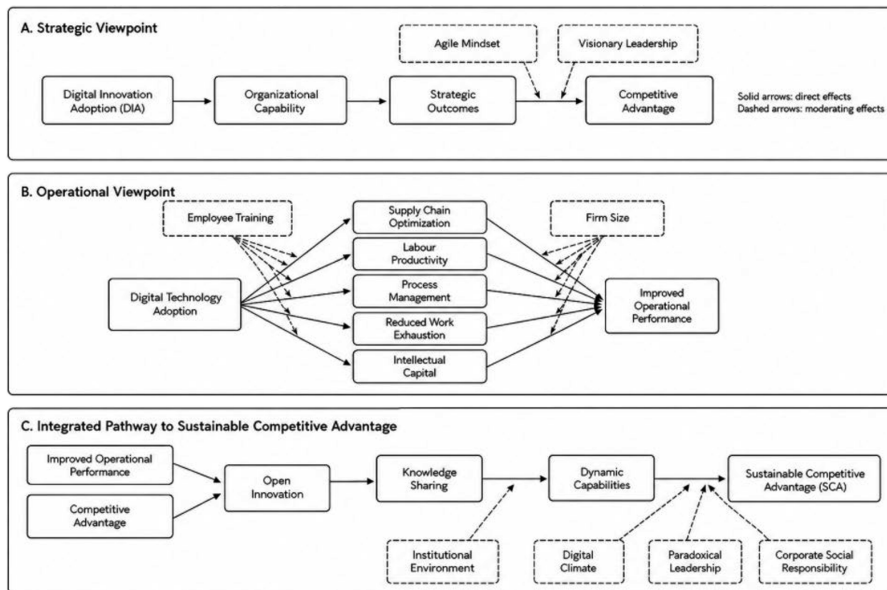


Figure 2. Conceptual framework. Source: Authors' own work

P2: Strategic outcomes positively influence the competitive advantage of SMEs.

P3a: Agile mindset positively moderates the relationship between strategic outcomes and competitive advantage, such that the positive effect of strategic outcomes on competitive advantage is stronger when an agile mindset is higher.

P3b: Visionary leadership positively moderates the relationship between strategic outcomes and competitive advantage, such that the positive effect of strategic outcomes on competitive advantage is stronger under higher levels of visionary leadership.

5.2.2 Operational viewpoint – framework. This framework is linked to the implementation of tools such as Industry 4.0, blockchain or cloud computing (Bettiol *et al.*, 2024; Wong *et al.*, 2024). Process management is a key mediator; only when it becomes an integral part of primary processes, digital value is generated (Kahveci *et al.*, 2024). Industry 4.0 is linked to higher labour productivity (Bettiol *et al.*, 2024) and decreased work exhaustion (Wasim *et al.*, 2024). Information sharing and visibility improve efficiency through blockchain and supply chain service platforms (Wong *et al.*, 2024; Hong *et al.*, 2021). Finally, the adoption of cloud-based accounting infrastructure tends to have a positive impact on human capital and relational capital (Khan *et al.*, 2024). All these operational mechanisms relate to operational outcomes of a firm, which is a system of practical, measurable, tangible gains (Jam *et al.*, 2025). The literature indicate that human resource practices such as training and empowerment in terms of operational performance are to be analyzed (Bettiol *et al.*, 2024; Lathabhavan and Kuppusamy, 2024).

Propositions for empirical testing are as follows:

P4: Digital technology adoption positively influences operational performance through mediators such as supply chain optimization, labour productivity, process management, reduced work exhaustion, and intellectual capital.

P5a: Employee training is a first-stage moderator that moderates the relationship between digital technology adoption and the mediators.

P5b: Firm size is a second-stage moderator that moderates the relationship between mediators and operational performance.

5.2.3 Integrated framework. The two perspectives have been linked in a composite architecture to fill the knowledge gaps present in the literature. The innovation linkage between the strategic and operational segments is open innovation (OI). Although the previous literature discusses OI as the intermediary between DCs and performance (Pundziene and Geryba, 2023), we postulate that OI produces knowledge sharing and DCs, and eventually the SCA.

According to Marino-Romero *et al.* (2024), knowledge-intensive business services' digital capability is a predictor of DT that results in better organizational performance. Lastly, multiple situational conditions mediate the connection between DC and long-term advantage, such as digital climate, paradoxical leadership and corporate social responsibility (CSR). According to Baumann-Pauly (Baumann-Pauly *et al.*, 2013), small companies do not always lag larger companies in the arrangement of CSR.

Propositions for empirical testing are as follows:

P6a-b: Strategic and operational outcomes such as competitive advantage and improved operational performance, positively influence SMEs' engagement in OI.

P7: Improved OI positively influences knowledge sharing in SMEs.

P8: Knowledge sharing positively influences the development of DCs in SMEs.

P9: The institutional environment moderates the relationship between knowledge sharing and dynamic capabilities, such that a more supportive institutional environment strengthens the positive effect of knowledge sharing on dynamic capabilities.

P10: DCs positively influence the SCA of SMEs.

P11: Digital climate positively moderates the relationship between DCs and SCA, such that the positive effect of DCs on SCA is stronger in SMEs with a more supportive digital climate.

P12: Paradoxical leadership positively moderates the relationship between DCs and SCA, such that the positive effect of DCs on SCA is stronger under higher levels of paradoxical leadership.

P13: CSR positively moderates the relationship between DCs and SCA, such that the positive effect of DCs on SCA is stronger when SMEs exhibit higher levels of CSR.

6. Conclusion

The extensive literature review proves the assumption that DIA is not only a technical upgrade of SMEs but a complex, strategic and operational necessity to survive and develop (Marino-Romero *et al.*, 2024). Technology adoption and value creation have a complex and nonlinear relationship, which depends on a range of mediating and moderating variables. Digital technology is not unlocked by its mere presence but through the foundational capabilities of the firm, including its leadership and human capital, as well as its capacity to reorganize its internal processes and business models around digital tools (Gyamerah *et al.*, 2025; Broccardo *et al.*, 2024a; Scuotto *et al.*, 2021).

The adoption of digital at the strategic level makes the formulation of DCs such as agility and resilience feasible, which is key to gaining a competitive advantage in a turbulent environment (Sinha *et al.*, 2024; Troise *et al.*, 2022). In operational terms, it has tangible

benefits in labour productivity, supply chain performance and process enhancements because it allows new ways of working and managing the intellectual capital of a firm (Bettiol *et al.*, 2024; Wong *et al.*, 2024; Cleary and Quinn, 2016). This finding of contradictions and non-linear relationships in the literature indicates that more detailed, comparative and longitudinal research is necessary in the future.

This review acknowledges an important limitation, which is that the market-orientation viewpoint is not completely included in our proposed conceptual framework. However, it is used as a complementary dimension along with strategic and operational viewpoints. We have synthesized how marketing orientation helps DIA to yield SCA in our discussion. Wasim *et al.* (2024) illustrate that market orientation, combined with digital technologies like IoT and supported by creativity, positively affects the performance of SMEs and that this is an important path towards creating SCA. Future research is recommended to further develop the strategic and operational approach developed here by adding market orientation as a third dimension in the integrated model.

The findings from the selected studies explain the impact of DIA on SMEs. Also, it suggests key mechanisms through which SMEs can achieve a competitive advantage and improved operational performance. This paper thus makes a dual contribution. First, it offers a comprehensive synthesis of current research on DIA and competitive advantage for SMEs. Second, it outlines a research conceptual framework and propositions for the development of new or extended theoretical frameworks, where research gaps found from the literature are considered.

Finally, the findings of the report can be a solid theoretical and practical background for digital innovation in SMEs. They emphasize that to achieve success, SMEs cannot perceive DT as an IT project, but rather as an organization-wide change process that should be supported by different leadership styles, strategic resource distribution and a strong willingness to adapt and evolve in a changing digital environment.

(The Appendix follows overleaf)

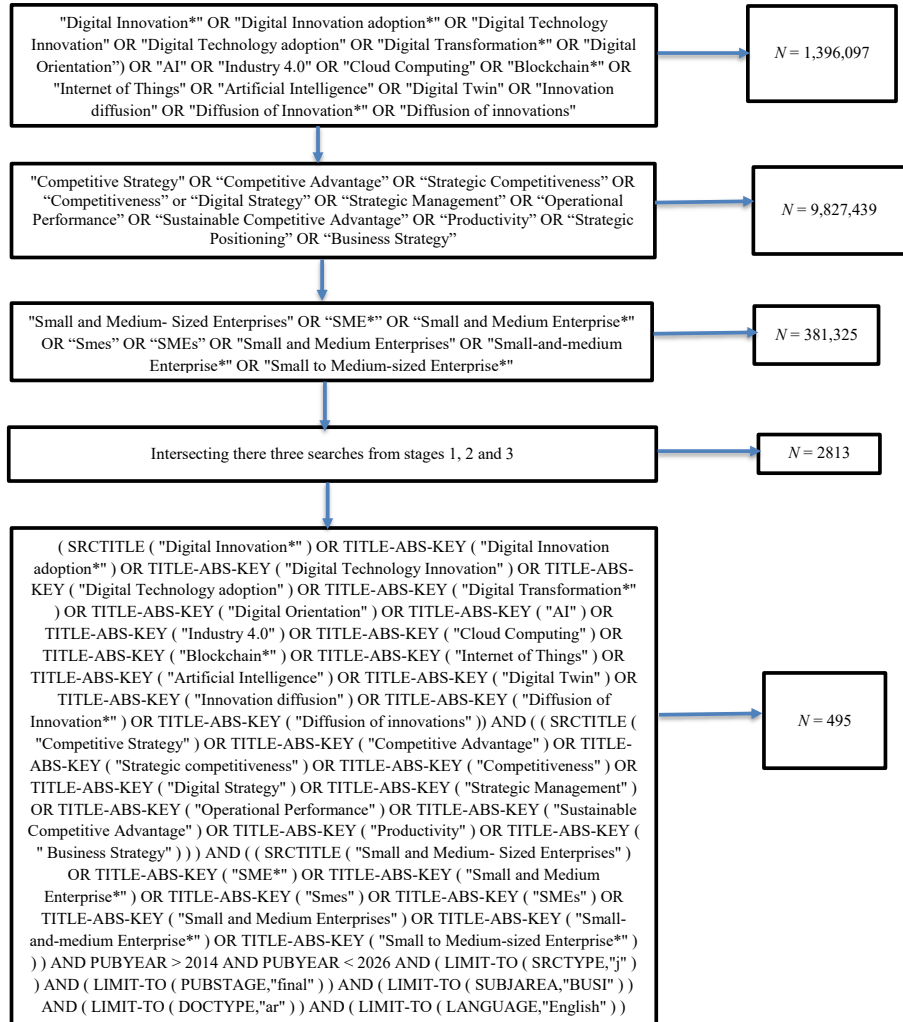


Figure A1. Scopus database search strategy and search string. Authors' own work

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