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Article

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Role of digital transformation for sustainable competitive advantage of SMEs: a systematic literature review

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ABSTRACT

The digital revolution has fundamentally changed how businesses create value. Small and medium enterprises (SMEs), with their limited resources, must adapt to this new landscape to maintain a competitive edge through digital transformation (DT). This paper explores how SMEs can build sustainable competitive advantage (SCA) via DT. Using the WOS Core Collection database, we conducted a comprehensive review and bibliometric analysis, examining 1,856 articles on SCA, with a detailed focus on 57 that specifically address DT. The findings show that DT enhances SMEs' innovation and dynamic capabilities, helping them overcome resource constraints and better respond to market shifts. Key digital technologies such as big data, artificial intelligence, and digital platforms are crucial in driving these results. Practical insights are also offered for SMEs managers to tailor digital strategies, optimize operations, and build SCA.

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Small business management; Strategic management; Management of technology & innovation

1. Introduction

Sustainable competitive advantage (SCA) is critical for firms to thrive and outperform competitors over the long term (Du et al., 2024; Wiggins & Ruefli, 2002). In today's highly competitive environment, businesses are no longer content with short-term gains and are increasingly focused on building enduring competitive advantages (Huang et al., 2015; Rifqi et al., 2024). However, from an economic perspective, competitive activities may cause profitability and market share to regress to the mean over time, which can lead to the erosion of a firm's competitive edge (Maury, 2017; Wiggins & Ruefli, 2002). Therefore, how to sustain competitive advantage remains a central topic in academic discussions, particularly concerning how small and medium enterprises (SMEs) can achieve and maintain such an advantage in a rapidly changing market.

SMEs play a pivotal role in both developed and developing economies, driving employment and innovation (Gherghina et al., 2020; Mago & Modiba, 2022). Although the criteria for defining SMEs differ globally, they are commonly based on the number of employees and business revenue (Montoro-Sanchez et al., 2018). While SMEs tend to exhibit greater agility and adaptability to environmental changes, they often face constraints in resources and professional capacity (Costa et al., 2024; Troise et al., 2022). These challenges prompt SMEs to continually seek ways to sustain their SCA, particularly in the context of digital transformation (DT).

Academic perspectives on the relationship between DT and competitive advantage are divided. One view argues that the rapid evolution of digital technologies undermines the sustainability of competitive advantage, making SCA temporary and rare in today's complex economic environment (D'Aveni et al., 2010; McGrath, 2013). In contrast, another perspective suggests that digital technologies, such as big data, digital platforms, and blockchain, enable firms to build and maintain SCA by improving adaptability and performance (Garmaki et al., 2023; Kristoffersen et al., 2021; Liu et al., 2023; Sarfraz et al., 2023). This

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view emphasizes that digital capabilities allow organizations to seize new opportunities and achieve superior outcomes.

Nevertheless, the mechanisms linking DT and SCA remain complex and multifaceted (Xue et al., 2022). To address this, the first objective of this research is to explore how DT helps SMEs build and sustain SCA in competitive environments.

RQ1: How does DT contribute to the development and sustainability of competitive advantage in SMEs?

The second objective is to identify specific digital technologies that enable SMEs to overcome resource constraints and enhance their SCA in rapidly changing markets.

RQ2: What specific digital technologies help SMEs overcome resource constraints and enhance their SCA in a rapidly changing market environment?

The remainder of this paper is organized as follows: Section 2 details the research methodology and data processing. Section 3 presents the data analysis and results. Section 4 provides a discussion, highlighting new findings, and answers the research questions. Section 5 identifies gaps for future research. Finally, Section 6 presents the conclusions.

2. Methodology

To ensure systematicity and rigor in our literature review, we employed the systematic literature review (SLR) method. Following the recommendations of Kraus et al. (2020) and Tranfield et al. (2003), we structured the research process into three stages: planning, operation, and dissemination, as illustrated in Figure 1.

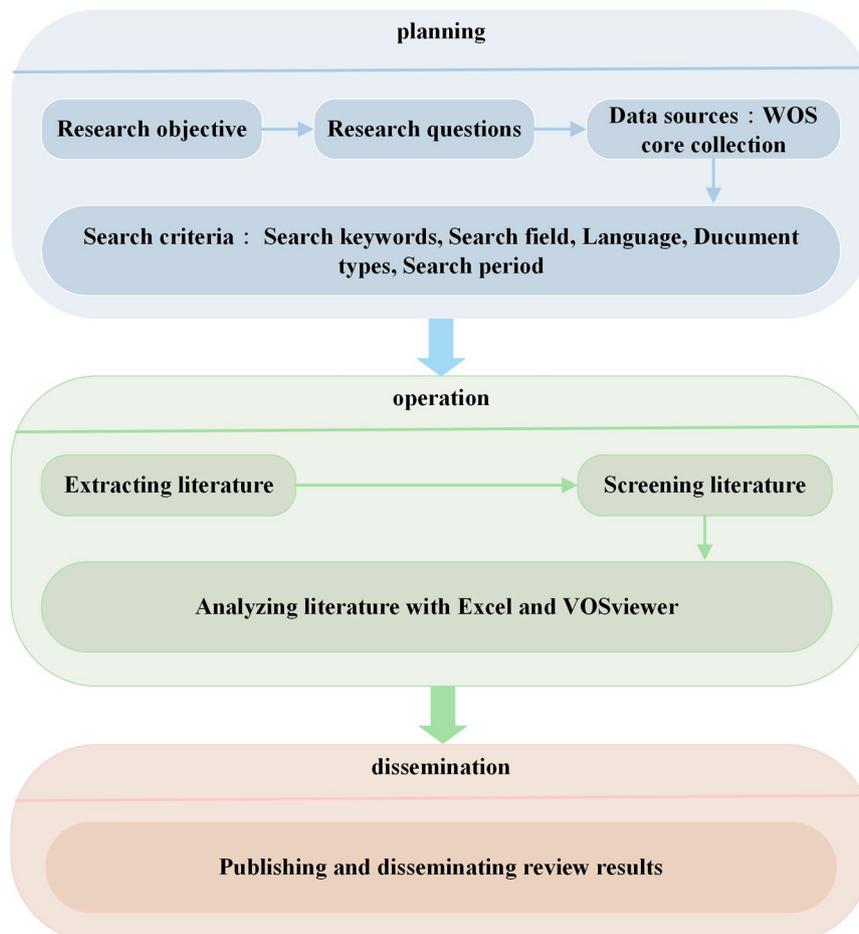


Figure 1. The literature review process.

First, in line with our research objective of investigating the impact of DT on the SCA of SMEs, we developed the research questions, RQ1 and RQ2, and identified relevant data sources and search criteria. In the operation stage, we extracted the literature from the designated databases, screened the eligible studies, and analyzed the data using Excel and VOSviewer. Finally, the review results were compiled and disseminated in the dissemination stage.

2.1. Stage 1: Planning the review

Accurate literature data is fundamental to conducting a SLR, as the precision of the data is critical (Wolfswinkel et al., 2013; Zhou et al., 2023). After defining the research objectives and questions, we developed a search plan outlining the scope of literature selection, as shown in Table 1. We chose the Web of Science (WOS) Core Collection databases, which are widely recognized by academics for their comprehensive coverage and high-quality literature (Chadegani et al., 2013). Following the recommendations of Kraus et al. (2020), we focused on peer-reviewed published articles and review articles, excluding conference proceedings, books, and other materials.

Our search criteria included the topic fields (title, keywords, and abstract) and were restricted to English-language papers. As shown in Table 1.

2.2. Stage 2: Operating the review

In this stage, we carried out literature extraction, screening, and analysis. First, we searched the literature databases following the protocol established in the previous stage. Using 'sustainable competitive advantage*' as the topic keyword, we initially selected 1935 papers. With the keywords 'sustainable competitive advantage' AND 'SMEs' OR 'small and medium enterprises', 152 papers were identified, and using 'sustainable competitive advantage*' AND 'digital transformation*' OR 'digitalization*' OR 'digitalisation*' only 61 papers were found.

In the WOS Core Collection database, we selected 'Full Record and Cited References' to export the paper records into Excel sheets. Afterward, we reviewed the document types and excluded book chapters and retracted papers. The screened paper data is shown in Table 2.

We utilized the bibliometric software VOSviewer to analyze the literature in this review. VOSviewer systematically examines literature by analyzing keywords, authors, institutions, journals, and other relevant information (Hosseini et al., 2018; Shaharudin et al., 2019). It is widely recognized for its effectiveness in visualizing complex relationships within large sets of academic publications (Kirby, 2023). One of its key strengths is its ability to efficiently handle large datasets, generating visual maps that clearly illustrate clusters of research topics and collaborations.

Table 1. Literature review parameters.

Parameter	Description
Search database	Web of science core collection
Search field	Topic=title, abstract, keywords, keywords plus
Search keywords	'Sustainable competitive advantage*'; 'sustainable competitive advantage*' AND 'SMEs*' OR 'small and medium enterprises*'; 'sustainable competitive advantage*' AND 'digital transformation*' OR 'digitalization*' OR 'digitalisation*'
Language	English
Document types	Article and review article
Time span	Until 21st September 2024

Source: Author's elaboration.

Table 2. Search results of the database.

Topic keywords	Article number	Screening result
'Sustainable competitive advantage*'	1935	1856
'Sustainable competitive advantage*' AND 'SMEs*' OR 'small and medium enterprises*'	152	149
'Sustainable competitive advantage*' AND 'digital transformation*' OR 'digitalization*' OR 'digitalisation*'	61	57

Source: Author's elaboration.

advantage through DT and innovation. Early theories, such as the resource-based view, continue to serve as foundational frameworks for these studies.

3.2. Keywords analysis for SMEs' SCA

Given the limited research on the SCA of SMEs in the context of DT, we conducted separate analyses of the SCA of SMEs and the SCA within the context of DT.

Out of the 1,856 papers on SCA, we identified only 149 studies that specifically focus on SMEs' SCA. We analyzed these studies using VOSviewer and presented the results in Figure 3. As shown in the figure, apart from the SCA and SMEs nodes, there are no significantly larger nodes, indicating that research in this area is relatively fragmented. However, the color of the nodes reveals that in recent years, topics such as 'eco-friendly product', 'business environment', 'entrepreneurial capabilities', 'adoption behavior', and 'learning' have become primary research focuses.

Furthermore, the cluster relationships show that keywords such as 'entrepreneurial orientation' and 'dynamic capabilities' emerge around the core themes of SCA and SMEs; this indicates that research on how SMEs can achieve SCA through innovation and dynamic capabilities is an important research direction. 'Entrepreneurial orientation' is closely associated with terms like 'entrepreneurial marketing' and 'business model innovation', highlighting the significance of innovation orientation, market strategy, and business model innovation in achieving SCA. Meanwhile, keywords such as 'open innovation' and 'absorptive capacity' link to 'dynamic capabilities', highlighting the crucial role of a firm's dynamic and absorptive capabilities in maintaining a competitive advantage in rapidly changing markets.

3.3. Keywords analysis for SCA and DT

Figure 4 highlights the research hotspots in the fields of DT and SCA. The larger nodes, such as 'dynamic capabilities', 'Industry 4.0', and 'big data', indicate that leveraging big data and dynamic capabilities to achieve competitive advantage within the context of DT is a key research focus. The blue-green nodes, such as 'sustainability' and 'big data analytics', suggest that researchers have been

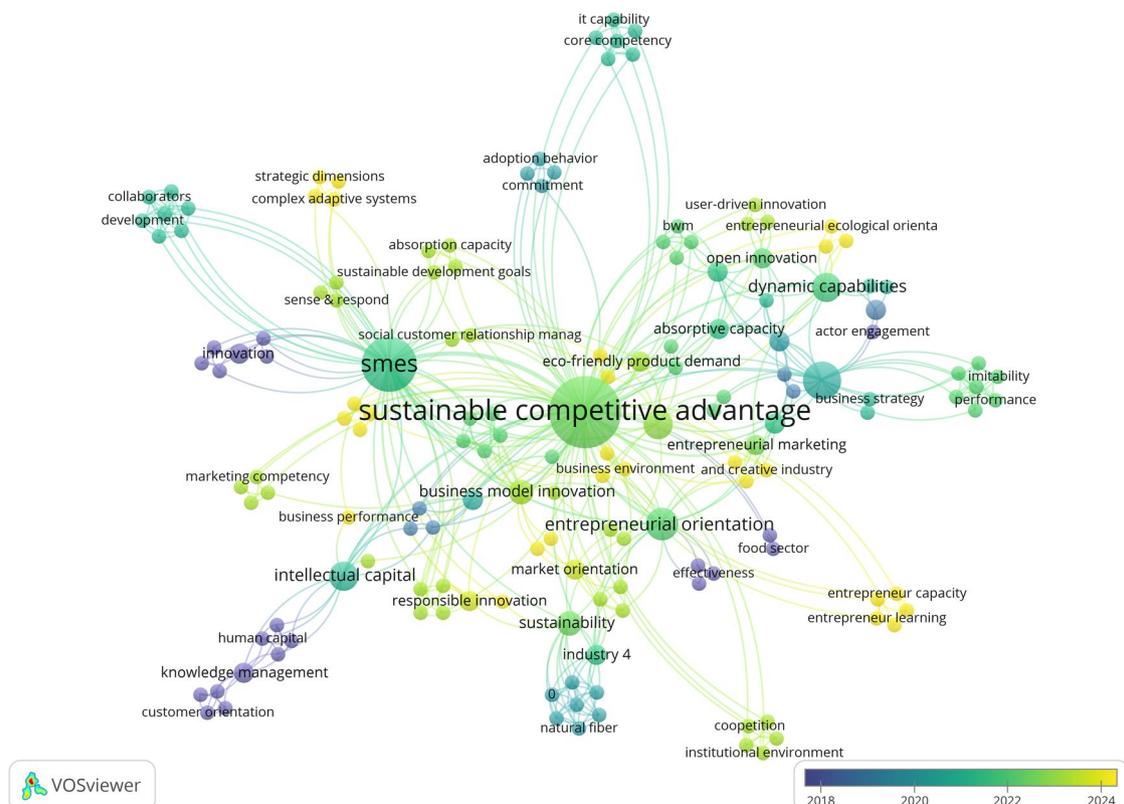


Figure 3. SMEs' SCA author keywords overlay visualisation bibliographic coupling.

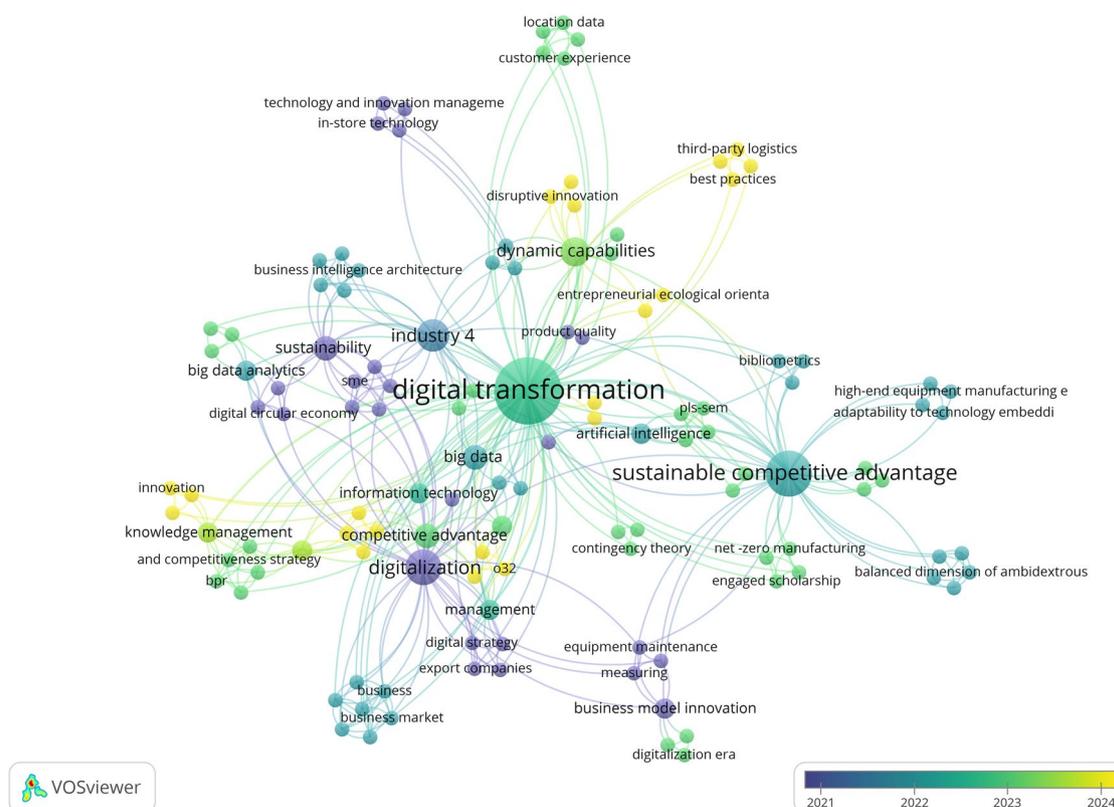


Figure 4. SCA and DT author keywords overlay visualisation bibliographic coupling.

exploring these topics regularly since 2021 or earlier. In contrast, the yellow and green nodes, such as ‘disruptive innovation’ and ‘entrepreneurial ecological orientation’, represent emerging research areas from recent years (2022–2024). Additionally, the thick lines between ‘digital transformation’ and ‘dynamic capabilities’ demonstrate the close relationship between these two concepts. There are also connections between ‘sustainable competitive advantage’, ‘contingency theory’, and ‘business model innovation’, indicating that researchers are investigating how business model innovation can drive SCA in the context of DT.

Figure 4 also presents several research clusters, each focused on distinct research themes. In the DT cluster, keywords like ‘Industry 4.0’, ‘big data’, ‘information technology’, and ‘dynamic capabilities’ emphasize the direction of technology-driven transformation, the application of dynamic capabilities, and the integration of big data within DT. The SCA cluster includes terms like ‘business model innovation’ and ‘contingency theory’, highlighting that achieving SCA through innovative business models and contingency theory is a significant research focus. In the dynamic capabilities cluster, keywords such as ‘disruptive innovation’ and ‘absorptive capacity’ reflect the importance of these capabilities in maintaining competitiveness within rapidly changing market environments. The presence of technological themes, such as big data, artificial intelligence, and Industry 4.0, indicates that leveraging these technologies to enhance competitive advantage is a key research direction. The strong connections between ‘big data’, ‘digital transformation’, and ‘sustainable competitive advantage’ suggest that big data analytics plays a crucial role in helping firms achieve and maintain competitive advantage.

3.4. Detailed analysis of key literature

Based on our research objectives, which focus on the contribution of DT to the SCA of SMEs, as well as the key technologies and capabilities that influence SMEs’ SCA, we conducted a detailed analysis of 57 research papers related to DT and SCA. The analysis covered aspects such as publication year, research methods, theoretical frameworks, research content, key findings, and innovations. Table 3 displays the analysis results.

Table 3. SCA and DT topic paper analysis statistics table.

Target	Content	No	%
Year	2024	8	14.04
	2023	22	38.60
	2022	16	28.07
	2021	6	10.53
	2017–2020	5	8.77
Theory	Resource-based theory	15	26.32
	Dynamic capability theory	15	26.32
	Innovation theory	8	14.04
	Strategic theory	7	12.28
	Grounded theory	2	3.51
	Stakeholder theory	2	3.51
Method	Questionnaire	26	45.61
	Case study	14	24.56
	Interview	11	19.30
	SEM (PLS-SEM, AMOS)	26	45.61
	Regression analysis (SPSS, Stata)	6	10.53
	fsQCA	3	5.26
Key words	DT and digitalization and digitalisation	44	77.19
	SCA	13	22.81
	Capability and capabilities	14	24.56
	Innovation	11	19.30
	Dynamic capability	7	12.28
	Big data	7	12.28
	Business model	7	12.28
	Technology	5	8.77

Source: author's elaboration.

Note: The percentage is the number divided by the total number of articles (57).

Based on the selected literature on DT and SCA, we conducted a detailed analysis of the field. The first article on this topic was published in 2017, and the number of publications began to grow rapidly in 2022, indicating that the relationship between SCA and DT is gaining increasing attention from scholars. Among the theories frequently employed in these studies, resource-based theory (RBT) is the most prominent, appearing in 26.32% of the total literature. Dynamic capabilities theory is equally prevalent, sharing the same proportion as RBT. Innovation theory and strategic theory follow, with proportions of 14.04 and 12.28%, respectively. These findings indicate that numerous scholars perceive innovation as a crucial element in fostering SCA, and widespread consensus supports the implementation of DT as a strategic initiative.

In terms of research methods, surveys combined with regression analysis or structural equation modeling are the most commonly used approaches, representing half of the analyzed studies. The extensive application of case studies, particularly in earlier research, accounts for 24.56% of the total. Additionally, 19.3% of the studies utilized interviews, including both semi-structured and in-depth interviews. Notably, two papers published in 2024 employed fsQCA in combination with other quantitative methods, while one paper from 2023 used fsQCA exclusively for analysis. This trend suggests a growing diversity of research methodologies within the field.

We compiled the keywords from 57 articles in Excel and performed a statistical analysis, with the results shown in Table 3. Aside from our selected themes of SCA and DT, the most frequently mentioned keywords were 'capabilities' (24.56%) and 'innovation' (19.3%). Capabilities mainly refer to dynamic capabilities and big data capabilities, while innovation research focuses on technological innovation and business model innovation. Consequently, we frequently mentioned 'technology' (8.77%), 'big data' (12.28%), and 'business model' (12.28%). These results align with our previous analysis using VOSviewer, indicating that in the context of DT, enhancing competitive advantage through these technologies and innovations (Bilal et al., 2024) is a significant research focus.

4. Discussion of the results

This study aimed to investigate two key research questions (RQ1 and RQ2) related to how DT impacts the SCA of SMEs and the specific digital technologies and capabilities that facilitate this process. In this section, we will first address RQ1, examining the role of DT in building and sustaining CA in competitive

environments. Next, we will focus on RQ2, identifying the key digital technologies that help SMEs overcome resource constraints, as shown in Table 4.

4.1. DT's contribution to building SCA in SMEs

In Part 3, Figure 2 shows that firms enhance their SCA by improving dynamic capabilities and innovation to adapt to external changes. Figure 3 highlights how SMEs can leverage open innovation and business model innovation to seize market opportunities, improve product and service quality, and achieve SCA. Figure 4 emphasizes the critical role of digital technologies, such as big data and artificial intelligence, in driving innovation. These technologies not only optimize operations but also enhance data-driven decision-making, improving firms' innovation capacity and market responsiveness, thus strengthening SCA. Table 3 further quantifies the importance of capabilities and innovation in achieving SCA, with 'capabilities' and 'innovation' being the most frequently mentioned keywords, particularly big data capabilities and technological innovation. Therefore, answer RQ 1, we propose that in the process of DT, SMEs should actively explore and apply digital technologies to reshape capabilities and drive innovation, ensuring the development of SCA.

4.1.1. Reshaping capabilities

The concept of capabilities, in particular dynamic capabilities and big data capabilities, is frequently mentioned in the literature reviewed as being crucial for SMEs in the context of DT (Garmaki et al., 2023; Trieu et al., 2024).

First, DT impacts an organization's dynamic capabilities across multiple dimensions. Environmental turbulence is a key characteristic of the digital age, and uncertainty in the environment drives DT, which in turn enhances an organization's dynamic capabilities and helps maintain SCA (Du et al., 2024; Rifqi et al., 2024). DT also moderates the relationship between new product development capabilities and SCA, with all aspects of these capabilities significantly influencing SCA (Sookbumroong & Phornlaphatrachakorn, 2023). Additionally, dynamic capabilities themselves contribute to DT, as they enable organizations to exploit market opportunities (Pang & Wang, 2023) and engage in strategic learning through continuous interaction with the changing business environment (Cho et al., 2023).

Second, big data capabilities are also a crucial factor in the digital age. Big data capabilities have a direct impact on business performance, so it is critical for business managers to enhance these capabilities when making decisions. Doing so is critical for the company's survival, growth, and SCA (Kryeziu et al., 2023). Moreover, big data capabilities improve employee performance in the digital economy, which underscores the need for employees to possess a certain level of digital literacy in order to achieve effective performance in digitalization and other business functions (Sadik Tatli et al., 2023). As a result, business managers should prioritize transforming employee skills to ensure that the company can achieve and sustain its competitive advantage.

4.1.2. Innovation-driven

Innovation is another key factor that can help SMEs achieve a SCA in the digital age (Bilal et al., 2024; Qing et al., 2024). As businesses face increasingly dynamic and competitive environments, the ability to adapt and innovate becomes essential. In particular, business model innovation (Jia et al., 2023; Lóska & Uotila, 2024) and technological innovation (Chupanova et al., 2021; León-Gómez et al., 2023) have

Table 4. Answers of research questions.

Research questions	Answers
How does DT contribute to the development and sustainability of competitive advantage in SMEs?	Reshaping capabilities (dynamic capabilities and big data capabilities), Innovation-driven (business model innovation and technological innovation).
What specific digital technologies help SMEs overcome resource constraints and enhance their SCA in a rapidly changing market environment?	Big data, artificial intelligence, digital platforms (Note: select the appropriate one.)

emerged as key drivers of SCA, allowing firms to optimize their operations, improve customer experiences, and create value.

Among the areas where innovation enhances SCA, business model innovation and technological innovation are particularly prominent (Chen et al., 2023). Leveraging digital technology to create new business models (Cho et al., 2023; Łóska & Uotila, 2024), improve customer experiences (Savastano et al., 2019), and add value (Chen et al., 2018) has proven effective in service industries such as retail, hospitality, and tourism (Alqarni et al., 2023), as well as for SMEs with limited resources (Cheng et al., 2024). Additionally, enhancing big data capabilities (Zhang et al., 2022), optimizing organizational structures (Zhang & Wang, 2024), and refining business processes can significantly bolster SCA in manufacturing.

In the digital age, changing technologies test the survival and development of SMEs. Dynamic capabilities and big data capabilities are crucial for SMEs in navigating the complexities of DT, helping them respond to environmental changes and improve decision-making. By leveraging these capabilities, firms can better allocate resources (Cheng et al., 2024) and adapt to new market opportunities, ensuring a stronger competitive position. However, alongside these enhanced capabilities, innovation plays an equally vital role in sustaining competitive advantage (Su & Wu, 2024). It is through continuous innovation that firms can not only adapt but also differentiate themselves in an evolving digital landscape (Garmaki et al., 2023; Kristoffersen et al., 2021).

4.2. Key digital enablers of SCA in SMEs

According to resource-based theory, digital technology is a valuable resource that (Martincevic, 2022; Sarfraz et al., 2023), when combined with others, helps organizations develop capabilities and build SCA (Okorie et al., 2023). For instance, digital technologies can optimize existing resources (Cheng et al., 2024), coordinate dynamic capabilities (Felsberger et al., 2022), drive operational transformation (Martincevic & Kozina, 2021), and achieve SCA. In service industries like banking and retail, digital technologies help analyze customer behavior (Shin & Cheng, 2023), influence purchasing decisions (Sharma et al., 2023), improve service quality, and enhance customer engagement.

Answer RQ2, according to the statistics in Table 3, big data technology in digital technology is the most researched, which indicates that scholars have always considered big data technology to be very important in the formation of an enterprise's SCA. From a management perspective, big data technology transforms executive practices, fosters innovative employee management (Conte & Siano, 2023), and contributes to organizational SCA. Additionally, enterprises with strong business analysis capabilities have stronger resource coordination capabilities and can establish more SCA in an increasingly competitive business environment (Kristoffersen et al., 2021). Hassanin and Hamada (2022) state that big data analytics can play an important role in building the pharmaceutical industry's self-sustaining competitive advantage by providing a health ecosystem for pharmaceutical companies.

SMEs, with limited resources, must carefully consider their specific circumstances when selecting digital technologies. First, big data is a crucial tool for SMEs to enable data-driven decision-making. It allows businesses to deeply analyze market demand and customer behavior, optimize supply chain management, and improve operational efficiency (Zhang et al., 2022). Second, artificial intelligence is increasingly being applied in SME operations. Artificial intelligence can automate routine tasks, reduce operational costs, and leverage intelligent customer service and data analysis to help businesses quickly adapt to market changes (Shin & Cheng, 2023). Additionally, cloud computing provides SMEs with flexible digital infrastructure, enabling them to scale their operations at low cost and compete globally (Liu et al., 2023). Through cloud platforms, SMEs can flexibly adjust their business models to meet the demands of different markets.

Which technology should we choose? This is the primary question facing SMEs as they seek to gain a SCA. DT is not a fashion show, and you don't need to buy any trendy technology. Although most of the existing literature supports big data technology (Garmaki et al., 2023; Hassanin & Hamada, 2022; Shah, 2022), it is worth noting that DT is not just 'technology application' but involves a major 'organizational revolution'. The basis for success is to choose digital technologies that match company culture, policies, and business needs, or the company can change existing systems to adapt to new technology applications.

5. Discussion of the future research agenda and gaps

This study highlights the significant impact of DT on the SCA of SMEs, particularly in terms of key technologies and capabilities. The study identifies gaps in previous research regarding theories, methodologies, and research subjects, and offers recommendations for future research, as shown in [Figure 5](#)

5.1. The research gaps

Existing research highlights the importance of DT for enhancing and maintaining SCA in SMEs (Lóska & Uotila, 2024), but there is still a lack of comprehensive theoretical frameworks to explain how DT specifically impacts SCA in SMEs. As shown in [Table 3](#), resource-based theory (RBT) and dynamic capabilities theory (DCT) are often used to explain how companies leverage digital technologies to gain a competitive edge (Felsberger et al., 2022; Okorie et al., 2023), but they fall short in addressing the unique challenges and advantages SMEs face in a digital environment. Key areas like the relationship between DT, innovation models, business model transformation, and cultural adaptability remain underexplored (Shin & Cheng, 2023).

Methodologically, most studies on SMEs' DT rely on quantitative research or case studies, with limited use of diverse methodologies ([Table 3](#)). Many studies use cross-sectional data, lacking longitudinal research, which means the long-term impact of DT on SMEs' SCA remains underexplored. Mixed methods (combining quantitative and qualitative approaches) could offer more comprehensive insights, but they are rarely used in the existing literature. Additionally, research samples are often concentrated in specific countries or industries, limiting the generalizability of findings. For instance, studies on the impact of digital platforms, big data, and AI on SMEs are mostly conducted in certain economies or industries (Alqarni et al., 2023; Conte & Siano, 2023), restricting the applicability of conclusions. Therefore, future research should cover a broader range of industries and regions to provide more generalizable insights.

Moreover, research on SMEs remains limited compared to studies focusing on larger firms. Of 1,856 papers on SCA, only 57 examine the role of DT, and just 7 focus on SMEs. Furthermore, most research focuses on developed economies like Europe (Kamšalić et al., 2020; Kristoffersen et al., 2021; Lóska & Uotila, 2024); and the US (Chesini & Giaretta, 2024; Yli-Viitala et al., 2020), with very few studies covering SMEs in developing countries or emerging markets. For example, research has mainly focused on a small number of countries such as Vietnam (Thai et al., 2024), Mexico (León-Gómez et al., 2023), and Kosovo (Kryeziu et al., 2024), and there is a lack of general analysis of SMEs in other regions. Since SMEs in different regions face varying challenges in terms of resources, market environments, and technological infrastructure, there is a need for broader and more inclusive studies.

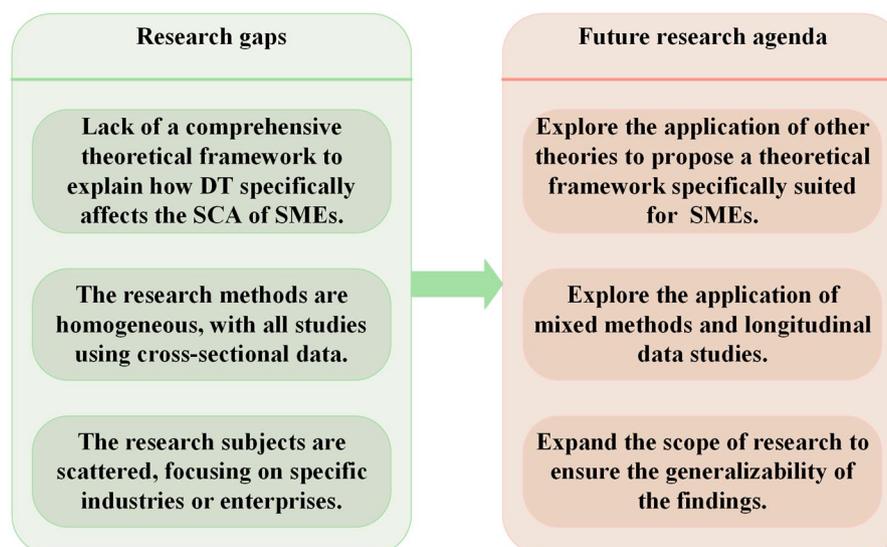


Figure 5. Research gaps and future research agenda.

5.2. The future research agenda

In terms of research theory, while resource-based theory (RBT) and dynamic capabilities theory (DCT) have provided a foundation, they have not fully explained how SMEs, with limited resources and relatively simple organizational structures, can enhance innovation, optimize resource allocation, and improve value chain integration through DT (Felsberger et al., 2022). Therefore, future research should further explore the complex relationships between DT, innovation models, business model transformation, and organizational cultural adaptability and propose theoretical frameworks specifically suited to SMEs. For example, integrating innovation ecosystem theory or stakeholder theory could offer a more comprehensive explanation of how SMEs enhance competitiveness in the DT (Chen et al., 2023; Dagestani et al., 2024; Eesley et al., 2016).

In terms of research methods, most existing studies rely on quantitative research or case studies, often using cross-sectional data, which limits understanding of the long-term impact of DT on SMEs' SCA (Kryeziu et al., 2024). Future research should adopt more longitudinal studies to uncover the dynamic effects of DT over time. Additionally, employing mixed-methods approaches, combining both quantitative and qualitative data, would provide more comprehensive insights. This would not only allow researchers to better understand the impact of DT on SME performance but also reveal internal organizational changes as firms navigate DT. For example, quantitative analysis could assess the benefits of digital technologies, while qualitative interviews could explore behavioral shifts among employees and management, offering a more holistic perspective (Shin & Cheng, 2023). Such approaches would provide a more nuanced understanding of DT's multifaceted impact on SMEs (Zhang et al., 2022).

6. Conclusions

This paper presents a comprehensive literature review to explore how DT helps SMEs establish SCA. The study reveals that SMEs can enhance their SCA by improving innovation and dynamic capabilities through DT. Additionally, it identifies key digital technologies such as big data, artificial intelligence, and digital platforms as essential tools that enable SMEs to overcome resource constraints and respond effectively to market changes, thereby strengthening their competitive positioning in dynamic environments.

From a theoretical perspective, this study advances the understanding of how DT promotes SCA in SMEs. While resource-based theory (RBT) and dynamic capabilities theory (DCT) provide a solid foundation, this research shows that DT is a complex and long-term process that requires the integration of additional theories, such as stakeholder theory and innovation ecosystem theory, to fully explore SCA in SMEs in the digital age. Furthermore, the systematic literature review suggests that future research should adopt a variety of research methods and broaden the scope of analysis to better understand how SMEs build and maintain competitive advantage in the digital era.

From a practical perspective, this study offers valuable insights for SME managers and decision-makers by highlighting how DT enhances SCA. The findings suggest that adopting digital technologies such as big data, artificial intelligence, and digital platforms enables SMEs to overcome resource limitations, optimize operational efficiency, and respond more effectively to market dynamics. The study recommends that SMEs avoid indiscriminately adopting popular technologies and instead focus on selecting digital tools that align with their specific needs. This approach can drive innovation, improve internal capabilities such as dynamic and big data competencies, enhance decision-making, and foster the development of new business models, ultimately boosting long-term competitiveness.

Despite the valuable insights gained from this research, some limitations should be acknowledged. First, the study only retrieved literature from the WOS core collection database; future research could incorporate additional databases such as SCOPUS and Google Scholar for comparative analysis. Second, the study focused solely on peer-reviewed English-language literature, excluding book chapters. Third, while the co-occurrence keyword analysis using VOSviewer has clear advantages, it cannot fully capture the specific ideas of individual papers. However, this does not significantly affect the analysis of broader research trends.

Author contributions

Huie Lu – Conceptualization, Data curation, Formal analysis, Software, Methodology, Original draft writing.
Muhammad Shabir Shaharudin – Validation, Methodology, Reviewing & Editing.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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Appendix A

Table A1.

NO	Title	Author, YEAR	Theory	Research methods	Keywords
1	Dynamic capabilities and digitalization as antecedents of innovation and sustainable performance: empirical evidence from Vietnamese SMEs	Vo Thai et al., 2024	Dynamic capability theory, innovation theory	Questionnaire method, structural equation modeling (SEM)	Dynamic capabilities, digitalization, business model innovation, sustainable business performance, Vietnam small- and medium-sized enterprises
2	Drivers of decision-making towards for digital transformation	Ulrich et al., 2024	Corporate behavior theory, digital transformation theory	Questionnaire survey, regression analysis, fuzzy set qualitative comparative analysis (fsQCA)	Digital transformation, competitive advantage, strategy management, profitability
3	Sustainable competitive advantage under digital transformation: an eco-strategy perspective	Du et al., 2024	Dynamic capability theory, entrepreneurial eco-system orientation theory	fsQCA, SEM (SPSS and AMOS)	Entrepreneurial ecological orientation, dynamic capabilities, sustainable competitive advantage, digital transformation, fuzzy set qualitative comparative analysis (fsQCA)
4	Technological integration for imitation deterrence of new entrants: evidence from the Japanese digital imaging industry in 1990–2014	Hamada, 2024	Resource-based theory, innovation theory	Case study, qualitative research	Product architecture design, digital imaging industry, entry deterrence, DSLR camera market, technological development
5	Digital transformation at third-party logistics providers: challenges and best practices	Mvubu & Naude, 2024	Innovation diffusion theory	Semi-structured in-depth interviews, qualitative research	Digital transformation, third-party logistics, challenges, best practices, South Africa
6	Digitally transforming the organization through knowledge management: a socio-technical system (STS) perspective	Thomas, 2024	Social-technical system theory	In-depth interviews, qualitative research	Knowledge management, digital transformation, drivers, social-technical system theory (STS), innovation
7	The interplay of lean six sigma, industry 4.0, and dynamic capabilities: pathways to sustainable competitive advantage	Rifqi et al., 2024	Dynamic capability theory	Questionnaire, PLS-SEM	Lean six sigma (LSS), Industry 4.0 (I4.0), dynamic capabilities (DC), sustainable competitive advantage (SCA), explanatory sequence model
8	The impact of digitalisation on the profitability of large US banks	Chesini & Giaretta, 2024	Knowledge base theory	Quantitative research	Digitalisation, digital banking, profitability, bank, knowledge-based theory, content analysis
9	New product development capability, sustainable competitive advantage, digital transformation, and marketing performance: evidence from Thailand	Sookbumroong & Phornlaphatrachakorn, 2023	Dynamic capability theory	Questionnaire, SEM, multiple regression analysis	New product development capability, Sustainable competitive advantage, digital transformation, marketing performance
10	Strategic orientation, dynamic capabilities, and digital transformation of commercial banks: a fuzzy-set QCA approach	Cheng et al., 2023	Strategic orientation theory, dynamic capability theory	Questionnaire, fsQCA	Strategic orientation, dynamic capabilities, digital transformation, fsQCA

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Table 1. Continued.

NO	Title	Author, YEAR	Theory	Research methods	Keywords
11	Digital transformation in corporate banking: toward a blended service model	LLóska & Uotila, 2024	Competitive advantage theory, innovation theory	Semi-structured interviews, case study, qualitative analysis	Business model development, service innovation, customer relationship management, banks, competitive advantage, value creation, information technology
12	The effect of electronic human resource management systems on sustainable competitive advantages: the roles of sustainable innovation and organizational agility	Alqarni et al., 2023	Dynamic capability theory, organizational agility theory	Questionnaire, PLS-SEM	Electronic human resource management systems, sustainable competitive advantage, sustainable innovation, organizational agility
13	Business process reengineering for designing a knowledge-enabled customer-centric competitiveness strategy	Al-Shammari, 2023	Knowledge management theory, business process reengineering theory	Systematic literature review, qualitative research	Business process reengineering, BPR, digital transformation, knowledge management, customer relationship management, CRM, customer knowledge, competitiveness strategy
14	Leading digital business model transformation in the K-pop industry: the case of SM entertainment	Cho et al., 2023	Strategic learning theory, leadership theory	Case study, semi-structured interview, qualitative research	K-pop, digital business model transformation, market pioneer, strategic learning, charismatic leadership, organizational capabilities, SM entertainment
15	Big data analytics capability and contribution to firm performance: the mediating effect of organizational learning on firm performance	Garmaki et al., 2023	Resource-based theory, dynamic capability theory, grounded theory	In-depth interview, qualitative research	Big data analytics, big data analytics capability, digital transformation, organizational learning, grounded theory
16	Platform business model innovation in the digitalization era: a "driver-process-result" perspective	Jia et al., 2023	Business Model Innovation (BMI) theory, value co-creation theory	Longitudinal single case study, semi-structured interviews, literature review, field observations	Platform, business model innovation, digitalization era, value co-creation
17	Unlocking sustainable competitive advantage: exploring the impact of technological innovations on performance in Mexican SMEs within the tourism sector	León-Gómez et al., 2023	Competitive advantage theory, technology innovation theory	Telephone survey, PLS-SEM	Environmental sustainability, technological innovation, performance, PLSSSEM, information and communication technologies (ICT), digitalization
18	The impact of digital transformation on supply chain capabilities and supply chain competitive performance	Ning & Yao, 2023	Contingency theory, resource-based theory	Questionnaire, SEM	Digital transformation, supply chain capability, sustainable competitive performance, contingency theory
19	Digital transformation and the circular economy: creating a competitive advantage from the transition towards net zero manufacturing	Okorie et al., 2023	Resource-based theory	Literature review, seminars, interviews	Digital transformation, resource-based view, net-zero manufacturing, circular economy, sustainable competitive advantage, engaged scholarship
20	How digital transformation promotes disruptive innovation? Evidence from Chinese entrepreneurial firms	Pang & Wang, 2023	Dynamic capability theory, cross-organizational collaboration theory	Questionnaire survey, multiple regression analysis	Digital transformation, interorganizational collaboration, disruptive innovation, dynamic capabilities, entrepreneurial firms
21	The mediator role of task performance in the effect of digital literacy on firm performance	Sadik Tatli et al., 2023	Human capital theory	Questionnaire, SPSS analysis	Digital literacy, firm performance, human capital, task performance, white collar
22	Sustainable supply chain, digital transformation, and blockchain technology adoption in the tourism sector	Sarfraz et al., 2023	Resource-based theory	Questionnaire, SEM (AMOS)	

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Table 1. Continued.

NO	Title	Author, YEAR	Theory	Research methods	Keywords
23	Gaining user confidence in banking industry's quest for digital transformation: a product-service system management perspective	Shin & Cheng, 2023	Resource-based theory, consumer value theory	Questionnaire, SEM (AMOS)	Product-service systems, banking industry, Fintech quality, Fintech user confidence, resource-based view, utilitarian, conditional, and social values
24	Organisational resilience, ambidexterity and performance: the roles of information technology competencies, digital transformation policies and paradoxical leadership	Trieu et al., 2024	Resource-based theory, dynamic capability theory	Questionnaire, PLS-SEM	IT competencies, organisational ambidexterity, organisational resilience, paradoxical leadership, business performance, digital transformation policies
25	Data capital investment strategy in competing supply chains	Xin et al., 2024	Game theory, supply chain theory	Three-stage non-cooperative game model, numerical simulation	Supply chain competition, data capital investment (DCI), three-stage non-cooperative game, Stackelberg game
26	Research on influencing factors and path of digital transformation of manufacturing enterprises	Zhang & Wang, 2024	Grounded theory, resource-based theory, dynamic capability theory	Questionnaire, SEM	Manufacturing enterprises, digital transformation, digital dynamic capability
27	The effects of institutions, firm-level factors and rational decision-making on entrepreneurial behaviors of MSMEs: lessons and opportunities for transition communities	Kryeziu et al., 2023	Institutional theory, rational decision theory	Questionnaire surveys, quantitative analysis (SPSS and stata)	Entrepreneurial behavior, institutions, firm-level factors, rational decision-making, MSMEs
28	Creation of sustainable growth with explainable artificial intelligence: an empirical insight from consumer packaged goods retailers	Behera et al., 2023	Resource-based theory, competitive strategy theory	Questionnaire, SEM	Explainable artificial intelligence, sustainable growth, sustainable competitive advantage, information systems business value, competitive strategy
29	Harvesting the power of location data to improve customers' experience and destination attractiveness	Tsitiridou & Fouskas, 2023	Stakeholder theory	Field survey	Location data, customer experience, destination attractiveness, location technologies, digital transformation, interorganisational relations
30	Data-driven human resource and data-driven talent management in internal and recruitment communication strategies: an empirical survey on Italian firms and insights for European context	Conte & Siano, 2023	Human resource management theory	Questionnaire surveys, quantitative analysis (SPSS)	Big data, Industry 4.0, human resource, talent management, digital transformation
31	The impact of industry 4.0 on the reconciliation of dynamic capabilities: evidence from the European manufacturing industries	Felsberger et al., 2022	Resource-based theory, dynamic capability theory	Multiple case study, semi-structured interviews, questionnaires and self-assessment forms.	Industry 4.0, operations management, dynamic capabilities, case study research, manufacturing industry
32	Can big data analytics help organisations achieve sustainable competitive advantage? A developmental enquiry	Shah, 2022	Resource-based theory, knowledge-based theory,	Literature review, inductive method	Big data analytics, knowledge-based view, maturity model, resource-based view, sustainable competitive advantage, digital age
33	A big data strategy to reinforce self-sustainability for pharmaceutical companies in the digital transformation era: a case study of Egyptian pharmaceutical companies	Hassanin & Hamada, 2022	Dynamic capability theory	Literature review, case study and semi-structured interviews	Big data, digital transformation, Egyptian pharmaceutical companies, strategy, barriers

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Table 1. Continued.

NO	Title	Author, YEAR	Theory	Research methods	Keywords
34	How multidimensional digital empowerment affects technology innovation performance: the moderating effect of adaptability to technology embedding	Li et al., 2022	Resource-based theory, knowledge-based theory,	Questionnaire, SEM	Digital empowerment, technology innovation performance, adaptability to technology embedding, high-end equipment manufacturing enterprises, sustainable competitive advantage
35	Patterns and principles of the development of digital ecosystems	Lipovenko et al., 2022	Digital ecosystem theory, innovative business model theory	Literature review, case study	Innovative business models, digital environment, global competitiveness, statistical analysis
36	Seeking the resilience of service firms: a strategic learning process based on digital platform capability	LLiu et al., 2023	Dynamic capability theory, strategic learning theory	Questionnaire, SEM	Digital platform capability, strategic learning, resilience, service firms, legal environment
37	The correlation between digital technology and digital competitiveness	Martincevic, 2022	Competitiveness theory, digital transformation theory	Systematic literature review method	Information – communication technologies (ICT), digitalization, competitiveness, digital transformation, digital technologies, digital competitiveness, business market, business
38	Strategic capabilities for business model digitalization	Menchini et al., 2022	Social materiality theory, enterprise architecture theory	Survey method, focus group research, analysis of variance	Maturity in digital business models, enterprise architecture, sociomateriality
39	Achieving competitive sustainable advantages (CSAs) by applying a heuristic-collaborative risk model	Nunes et al., 2022	Risk management theory, social network analysis theory	Case study	Organizational risk management, organizational network analysis, critical success factors, business intelligence architecture, sustainability; organizational digital transformation, Industry 4.0
40	Green talent management and employees' innovative work behavior: The roles of artificial intelligence and transformational leadership	OOdugbesan et al., 2023	VRIO theory, stakeholder theory	Questionnaire, PLS-SEM	Green talent management, innovative work behavior, sustainable competitive advantage, transformational leadership, artificial intelligence, PLS-SEM
41	COVID-19 turbulence and positive shifts in online purchasing by consumers: modeling the enablers using ISM-MICMAC analysis	SSharma et al., 2023	Consumer behavior theory, supply chain theory	Expert opinion method, interpretive structural modeling method and MICMAC analysis	Supply chain, MICMAC, online purchase, COVID-19, changing buying behavior, digitization-commerce, ISM analysis
42	Research on digital transformation based on complex systems: visualization of knowledge maps and construction of a theoretical framework	Xu et al., 2022	Complex systems theory	Knowledge mapping, bibliometric analysis	Digital transformation, organization management system, bibliometrics; visual analysis, sustainable competitive advantage
43	Digital transformation of manufacturing enterprises: an empirical study on the relationships between digital transformation, boundary spanning, and sustainable competitive advantage	Xue et al., 2022	Resource-based theory, boundary-crossing theory	Questionnaire survey, stratified regression analysis	
44	Big data capability and sustainable competitive advantage: the mediating role of ambidextrous innovation strategy	Zhang et al., 2022	Dynamic capability theory, ambidextrous innovation theory	Questionnaire survey, stratified regression analysis	Big data capability, exploitative innovation strategy, explorative innovation strategy, balanced dimension of ambidextrous innovation strategy, combined dimension of ambidextrous innovation strategy, sustainable competitive advantage

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Table 1. Continued.

NO	Title	Author, YEAR	Theory	Research methods	Keywords
45	How to stimulate employees' innovative behavior: internal social capital, workplace friendship and innovative identity	Zhao et al., 2022	Social identity theory, conservation of resources theory	Questionnaires, SEM (SPSS and AMOS)	Internal social capital, innovative identity, workplace friendship, employees' innovative behavior, psychological factors
46	Entrepreneurship, digital capabilities, and sustainable business model innovation: a case study	Gao et al., 2022	Dynamic capabilities theory, entrepreneurship theory	Case study, quantitative data analysis	
47	Influence of digital technologies and its technological dynamics on company management	Martincevic & Kozina, 2021	Dynamic theory of technology, digital transformation theory	Questionnaire, regression analysis	Digitalization, digital strategy, digital transformation, digital technology, export companies, information and communication technologies (ICT), management
48	Supply chain management concept and digital economy: digital supply chain technological innovation	Chupanova et al., 2021	Supply chain management theory, digital transformation theory	Literature review, expert survey	Digital transformation, product quality, supply chain management
49	Artificial intelligence and business strategy towards digital transformation: a research agenda	Kitsios & Kamariotou, 2021	Strategic management theory, information technology theory	Systematic literature review method	Artificial intelligence, business strategy digital transformation, information technology, Industry 4.0, Sustainable competitive advantage
50	Stability in turbulent times? The effect of digitalization on the sustainability of competitive advantage	Knudsen et al., 2021	Big data and network effect theory, competitive advantage theory	Qualitative analysis, case study	Big data, network effects, digitalization, competitive advantage
51	The effects of business analytics capability on circular economy implementation, resource orchestration capability, and firm performance	Kristoffersen et al., 2021	Resource-based theory, resource coordination theory	Questionnaire, PLS-SEM	Digital circular economy, big data analytics, circular economy capability, sustainability, policy implication, digitalization
52	Global challenge: From intra-company staff management to working with the talent	Odegov, 2021	Talent management theory	Literature review, case study, empirical analysis	Skills mismatch, skills gap, staff shortage, talent, talent discovery and development, demand by occupational groups
53	Supporting the sustainability of natural fiber-based value chains of SMEs through digitalization	Kamišalić et al., 2020	Digital transformation and sustainability theory, value chain theory	Case study	Digitalization, digitalization index, SME, small and medium-sized enterprises, value chain, natural fiber, sustainability, Industry 4.0
54	Digitalisation as a driver of industrial renewal – perception and qualitative evidence from the USA	Yli-Viitala et al., 2020	Path dependence theory, strategic renewal theory	Qualitative research, semi-structured interviews	Digitalisation, industrial renewal, path dependence, manufacturing
55	Technology adoption for the integration of online–offline purchasing	Savastano et al., 2019	Omnichannel retail theory, innovative strategy theory, competitive advantage theory	Multiple case study, qualitative analysis	Technology and innovation management, digital transformation, in-store technology, omnichannel retailing, pioneering strategy
56	Equipment maintenance business model innovation for sustainable competitive advantage in the digitalization context: Connotation, types, and measuring	Chen et al., 2018	Business model innovation theory, value creation theory	Document analysis, semi-structured interviews, questionnaire surveys	Equipment maintenance, business model innovation, equipment maintenance business model innovation connotation, measuring; digitalization, sustainable competitive advantage
57	The case for a complete model of strategic resource utility in sport and entertainment management	Hayduk, 2017	Resource-based theory, dynamic capability theory	literature review, case study	Strategic management, resources, sport, entertainment