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Article

A Systematic Literature Review on SMEs Digital Transformation

Antonios Kargas [1], Dimitrios Drosos [1], Faidon Komisopoulos [1], Dimitrios Katsianis [2], Eleni Chaniotaki [1], Theodoros Rokkas [1], Athanasios Andriopoulos [1], Vasileios Argiroulis [1], Spyridon Filios [1], Georgios Loumos [1], Dimitrios Kokkinis [3] and Konstantinos Alvertos [1]

[1] Department of Business Administration, University of West Attica, 12243 Athens, Greece
[2] Department of Digital Industry Technologies, National and Kapodistrian University of Athens, 34400 Psachna, Greece
[3] Department of Informatics and Telecommunications, National and Kapodistrian University of Athens, 15772 Athens, Greece
* Correspondence: akargas@uniwa.gr

Abstract

Digital transformation is crucial for SMEs as it enhances organizational efficiency, productivity, and competitiveness by enabling process automation, cost reduction, and faster decision-making. It also allows SMEs to leverage emerging technologies, improve customer engagement, and access new markets, thereby fostering innovation and sustainable growth. The proposed study aims to reveal the most significant aspects regarding digital transformation in SMEs' business environment. Even though the concept of digital transformation has gained research interest, SMEs still face significant obstacles, including limited financial resources, a shortage of skilled personnel, and resistance to change within organizational culture. A systematic literature review (SLR) on the digital transformation of Small and Medium Enterprises (SMEs) was conducted to reveal enablers and obstacles encountered by these businesses in their pursuit of digital maturity. The review underscores the importance of human resources and digital maturity, emphasizing the need for a digitally skilled workforce and a culture of continuous learning. Results can enforce future research on the aspect and could focus on the relationship between digital transformation and organizational performance, the role of digital entrepreneurship, and the long-term effects of digital transformation, providing valuable insights to help SMEs navigate the complexities of digital transformation and achieve sustainable growth.

Keywords: digital transformation; SMEs; Systematic Literature Review

1. Introduction

In the contemporary era of pervasive digitization and advanced technology, digital transformation of business processes is a crucial and innovative imperative for organizations. Digital transformation is more than just implementing technologies across the various business operations and designing digital strategies [1], but moreover it encompasses a wholistic restructuring of organizational frameworks to enhance agility and flexibility and to adopt new business models [2–4].

Digital transformation involves redesigning conventional processes into sophisticated systems, profoundly impacting organizational functions and interactions with the public, collaborators, and workforce [5]. Such a complex systemic endeavor [4,6] is regarded by both scholars and practitioners as a key source to achieve organizational efficiency and business competitiveness [7]. Existing research demonstrates that digital transformation can foster business innovation, enhance customer experience, improve organizational performance, and strengthen market competitiveness [11–14]. It has also significant impacts on promoting technological innovation [8–10], improving financial performance [11,12], reinforcing organizational resilience [13], and enhancing the quality of

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relationships with the customer community [14]. It is a shift beyond traditional technical progress mechanisms [15], revolutionizing literature creation, dissemination, and consumption, and challenging traditional paradigms [16].

As far as small and medium-sized enterprises (SMEs) are concerned, existing literature reveals that they face difficulties, while the overall level of digital adaptation among SMEs remains low, and they significantly lag behind large enterprises [17–21]. The smaller the company, the lower the likelihood of adopting new digital solutions [19]. Moreover, SMEs are often more vulnerable to external crises that threaten market stability compared to larger firms, due to their limited resources—a phenomenon known as the "liability of smallness". However, the adoption of digital technologies by SMEs to support sustainability outcomes remains poorly understood [22,23].

Even though there exist research on the drivers and the barriers for SMEs' digital transformation, more theoretical and empirical research in needed [24,25] in order to reduce uncertainty risks when implementing digital strategies [26]. A primary driver of digital transformation is the pursuit of increased organizational efficiency and productivity, alongside with factors such as technology and human capital [6,27,28]. It enables process automation, cost reduction, and faster decision-making, while its landscape is complex, involving multiple systems across the enterprise. Effective implementation requires developing digital capabilities aligned with organizational policies and structures. However, limited financial resources, implementation's complexity, shortage of skilled personnel and competing priorities, often lead companies to neglect the digitization process [29].

At the same time, the business environment is changing due to the various digital technologies. Consumers now have access to multiple media channels, facilitating active interaction with companies and other consumers. They navigate various touchpoints, presenting businesses with opportunities to engage potential customers. At the organizational level, small, innovative, and rapidly growing digital entities have surpassed many traditional companies [28]. Such an environment is rather challenging especially when it comes to Small and Medium Enterprises (SMEs) who also face limited access to financial, organizational, and cognitive resources [30], resulting in a growing digital gap between SMEs and large corporations [31,32].

Existing research on entrepreneurship mainly puts emphasis on skills and capabilities [33], behavior of entrepreneurs [34] and their operating context [35], trying to indicate the factors that can lead them to business success [36,37]. Even though such a research progress exists, there is still a research gap regarding the interrelationship between digital transformation and entrepreneurship, especially when it comes in the ways the former changed or the reshaped from the scratch the latter [38].

Moreover, there exist research gaps related to digital transformation and its relationship with companies' age, size and revenues. As far as companies' size is concerned large firms have an advantage related with opportunities to reach easier financial, technological and human resources [39], while digital transformation for small and medium enterprises gathers research interest from both academics and businessmen as well [40]. It should not be neglected that SMEs are usually structured in a more agile way, an issue highly related with easiness to conduct changes when needed [41]. Moreover, small and medium sized companies are more eager to adapt to digital, business environment in order to ensure their viability and to achieve higher success and growth rates [42]. For example, during the COVID–19 pandemia many SMEs adopted various digital tools and developed digital applications to face the challenges occurred to reach their clients and to address their needs [43]. On the other hand, companies' age may directly affect their digital transformation maturity, especially when we refer to start ups or digital narrative companies [44]. The company's age issue is still under research to answer whether or not startups beside their small business experience are more digitally mature compared to older and well–established companies [45].

Another issue with controversial opinions is the relationship between digital transformation and business revenues. Even though there exists a theoretical link connecting digital transformation with increased revenues [46], empirical results do not support it, providing insight that expected revenues are lower than expected after major investments in digital transformation [47]. This evidence suggests that an indirect relationship may occur coming from cost minimization [48] and efficient resource

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usage [49] that are both related with digital transformation process, while researchers suggest that further empirical analysis in needed [50].

Current research aims to enlight the relationship between digital transformation and several aspects of SMEs business life. A systematic literature review (SLR) on the digital transformation of Small and Medium Enterprises (SMEs) was conducted to better understand how SMEs adopt digital transformation strategies and the most promising elements according to bibliography. The study examines key dimensions of digital transformation, providing valuable insights to help SMEs navigate the complexities of digital transformation and achieve sustainable growth.

2. Materials and Methods

A Systematic Literature Review (SLR) approach was applied to reveal how digital transformation is implemented in SMEs business environment in relation with enables and obstacles they may face. Even though the methodology originates from the medical field [51] while it soon passed to many other scientific fields including business studies (i.e., [52,53]. It aims to provide a systematic review of evidence on a specific topic, by using both qualitative and quantitative analysis of content [54,55]. It aims to provide a well-established knowledge base on a proposed topic of analysis by providing transparent protocols of research [56], in order to enhance future research [57].

The whole research process consists of three main stages [58], including (a) planning, (b) conducting the review and finally (c) reporting results. Of course, each one of the proposed stages can be further analyzed in several methodological steps such as collecting the research material, providing descriptive analysis of this material, categorize material according to several topics and of course evaluating the quality of the material and its relevance with the topic under research [59].

Researchers spent significant time finalizing the review question, following instructions of De Menezes and Kelliher [55]. Their aim was to have a broad, but focused vision of the research domain, so that to reach the exact nature of the research topic and to set appropriate objectives. In order to clarify all these aspects and the theoretical context of the subject area as well, researchers reviewed several seminal papers and agreed to follow five of them when developing their research focus. The choice was based on research relevance and papers' impact in terms of citations.

The first paper was written in 2015 [60] and was putting emphasis on a specific sectional (manufacturing SMEs) and regional (Germany) era. The SLR conducted for a period between 2013–2015 and included 9 articles, aiming to examine SMEs' awareness, readiness, and capability to adopt digital transformation needs and challenges. Results were mainly related to firms' size as an obstacle to effective adaptation to digital conditions. A few years later, Tarute et al. [61] conducted literature review for the period 2003–2018 and used 13 articles to identify internal and external factors that play critical role to the SMEs effective digital transformation. Results indicate that capabilities fit, resource fit and changes in the business model are the core internal factors, while as far as external factors are concerned these included governmental regulation, industry related factors (such as industry maturity, needs and expectations) and external factors including opportunities for collaboration / customization / strategic alternatives / embedded trust with other firms or organizations.

Zaheer et al. [62] conducted a structured literature review until 2019 and used 133 articles to provide research guidance related with digital entrepreneurship, putting emphasis on digital startups. Results indicate that there exists a lack of cohesive frameworks in the field of digital entrepreneurship, while existing knowledge is quite fragmented and disjointed. Isensee et al. [63] provided insight about the relationships between organisational culture, environmental sustainability, and digitalisation of SMEs by conducting a systematic literature review, for the period 2009–2019. They used 80 articles to propose thirteen key dimensions and to identify ten links between the key constructs. Finally, Meier [64] conducted a systematic literature review for the period 2000–2019 and used 77 articles to synthesize the heterogenous enablers and obstacles of SME digitalization. Results indicate 10 different technological foci and 38 enablers that affect all SMEs even though differently as a result of the heterogeneity between SMEs.

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Using the above - mentioned seminal papers (that cover the period up to 2019) the research focus targeted on conducting a systematic literature review for the period after 2020, up to 2024 to reveal internal and external drivers (enablers and obstacles) of digital transformation when it comes to SMEs., in order to answer the question "where research should go from this point and after". So the objectives set were to map research conducted on the topic of SMEs digital transformation, to enlight enablers and obstacles occurred and to recognize research gaps so that to propose a future research agenda. From that point after, the research strategy followed, aimed to minimize bias, to determine the exact terms of research, to select databases to conduct research and to apply the necessary inclusion and exclusion criteria.

As far as search strings are concerned, researchers selected generic terms to reach a broad view of the topic and to avoid excluding relevant studies. The search strings used, included "digital transformation" AND "SMEs" AND "enablers" OR "Obstacles", while the research was conducted on

- titles, abstracts and keywords for "digital transformation" AND "SMEs"
- all content for "enablers" OR "Obstacles".

Databases used were (a) EBSCO Business Source Complete, (b) Emerald, (c) Scopus-Elsevier and (d) Science Direct. The above–mentioned databases are considered as some of the most reliable, most used and with large coverage in business aspects databases [52,55,65,66], while researchers had access to full articles.

As far as inclusion / exclusion criteria are concerned, these were related with taking into consideration only (a) peer-review papers, (b) published in international papers and (c) written in English language. Such criteria were adopted so that ensure the validity of the scientific content [65], the higher possible impact [67,68] and the scientific acceptance of the academic and business communities [53]. Following such a research approach, excluded papers in other languages and scientific works such as conference papers and proceedings, book chapters, monographs and press articles [58]. Researchers avoided excluding papers based on journals' ranking, since such an approach could exclude significant studies coming from less prominent journals or different scientific disciplines.

Initial results provided a significant number of scientific articles, indicating an increased interest regarding SMEs' digital transformation during the pandemia and in the post–COVID 19 era. Researchers spent significant time removing irrelevant studies based on title screening, while the team adopted as principal not to exclude papers at this stage, when there was uncertainty about their relevance with the main research question. The same principle was adopted when the title did not provide enough evidence about the field or focus of the study. Each paper was evaluated from three independent researchers, to ensure that at least two out of three agree about its relevance. The whole approach ensured that only non-relevant articles would be excluded during this first, preliminary phase.

After this phase, the remaining papers were then reviewed by three researchers, different than the initial ones. During the second phase of inclusion / exclusion, researchers read all abstracts to verify papers relevance to the proposed research. The research team included papers with both quantitative and qualitative approaches to include every possible empirical evidence. Since enablers / obstacles' stings were located in main text, researchers decided to expand their review to full text as well, following the critical appraisal methodology as presented by Jones and Evans [69] in order to assess the validity of the selected studies.

Finally, selected papers were evaluated from another three academic researchers, not being involved in the review procedure at any stage, to assure papers' relevance with the research, alongside with the robustness of the criteria adopted to the whole process. Out of a mutual agreement, the total number of manuscripts was reduced to 81 as presented in Table 1.

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Table 1 Results from databases search

	Results from Initial research	Results after title and keywords analysis	Results after Abstract and full text analysis
EBSCO	130	3	0
Emerald	1 542	286	42
Scopus-Elsevier	36	8	6
Science Direct	1 949	342	33

Source: elaboration on the dataset

After the end of the above–mentioned procedure, the list of studies to be included was released, while the data extraction process began. This process is described in the next section, while it should be mentioned that this phase was done with digital means to reduce human error and to document this process [58,70].

3. Results

The corpus of this study included more than 81 documents (academic papers). Based on these papers we cleaned (e.g. remove numbers), transformed (e.g. lowercase the words) and stem the words. The corpus is tokenized into bigrams because they provide a more accurate view of the factors related to digital transformation. In total we acquired 87.000 different bigrams and Figure 1 illustrates the frequency distribution of the 20 top bigrams.

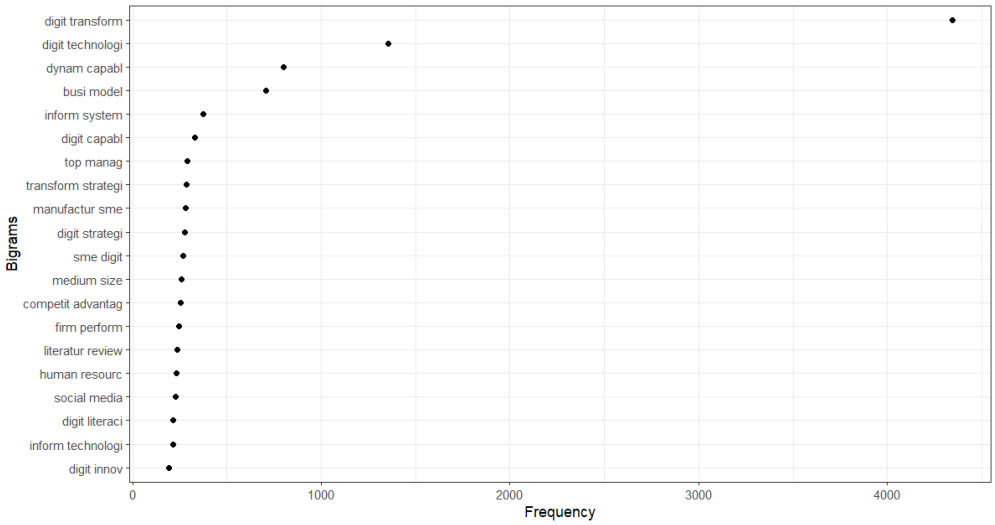

Figure 1. Bigram frequency distribution (top 20 terms).

Taking into account that we utilized three different sources of academic papers; we found it interesting to visualize the relative frequency of the top bigrams based on the source. As Figure 2 depicts [digit transform] is the most frequent across the sources as expected. Moreover, Emerald and Science Direct share the same four top bigrams [digit transform], [digit technologi], [dynam capabl] and [busi model].

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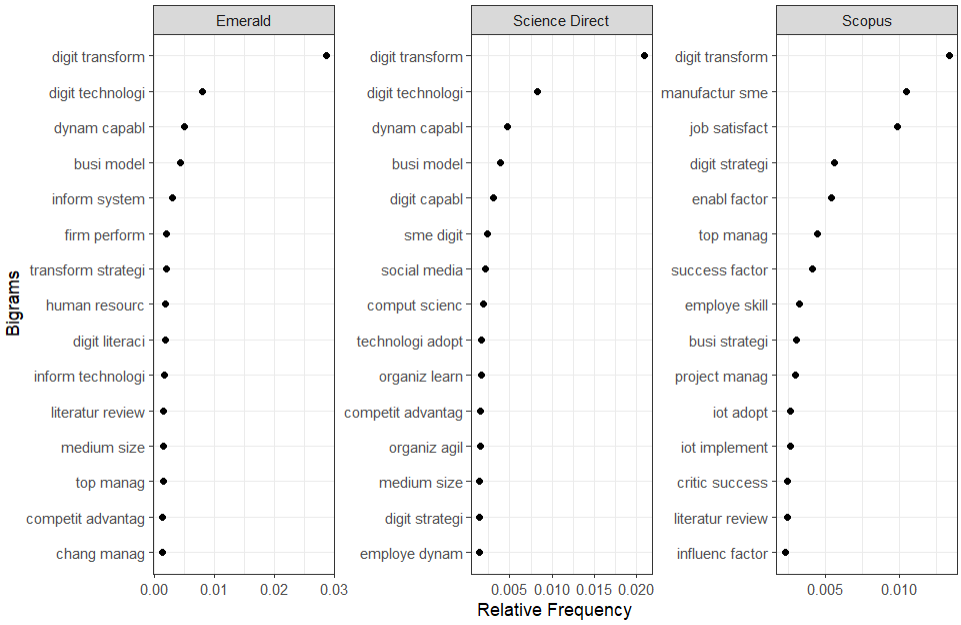

Figure 1 Bigram relative frequency distribution per source

Various approaches have been proposed to measure keyness between corpora, like the Ratio metric [71] and the Odds Ratio [72]. Our keyness analysis revealed some differences and two main factors may possibly explain these differences. First, the journals' thematic focus varies, while many journals from Emerald tend to address technology-driven topics, such as digital performance and digital strategy, within a firm's context. Second, different research types require the utilization of different linguistic styles. In our corpus, two key terms ("western balkan" and "welsh gover") appeared because of case studies with a regional focus. This suggests that some key terms may be influenced by specific linguistic or contextual features [73].

Keyness analysis was helpful because it revealed some characteristics of frequent bigrams and the role of abbreviations in our study. Keywords are linguistic markers which encode the essence or topical focus of a corpus. Therefore, it could potentially uncover a factor depending on how they connected to a document with other key term. As a consequence, the frequency of a term within a (sub)corpus might not be enough to reveal a factor and we suggest that a factor is a mixture of different key terms consistently found between different documents. From such point of view, it is possible to incorporate topic modeling and further study thoroughly examine the relationship between keywords within a document / corpus and (2) qualitatively assess the formation of different topics, to identify factors associated with the digital transformation of SMEs.

LDA analyzes words and documents to identify common aspects (topics) with the assumption that one document might covers different topics, and one word could be used simultaneously across different topics. We examined using expert opinion different results based on the experimentation few variables. First, the number of topics (k) is determined by research, and it is an important requirement by the LDA. Second, the number of bigrams we take into account. In this work we exclude bigrams with low frequency (less than 0.001%). Third, how many different documents (>3) include the bigram is another criterion we employed in order to avoid hapaxes. The results of LDA are presented in Table 2.

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Table 2. Extracted topics.

Topic number	Five top terms	Label	Description
Topic 1	social media, inform system, transform process, product develop, digit strategi	Digital Processes Implemented	Suggest a focus on how businesses reshape processes by using digital tools and strategies
Topic 2	technologi adopt, comput scienc, medium enterpris, digit twin, develop countri	Emerging Tech Adoption	Discuss technology adoption and relevant emerging tech trends
Topic 3	manufactur sme, chang manag, project manag, success factor, project success	Success of management's transformation to agile	Highlight the effort to implement digital management and departmental agility within the SMEs
Topic 4	busi perform, innov perform, competit advantag, organis capabl, firm perform	Performance and Capabilities	Elaborate with the focus on business outcome
Topic 5	digit tool, intellectu capit, digit divid, tool adopt, digit busi	Digital Vision and Digital Orientation	Combination of various business elements as a result of an existing digital vision and / or an existing digital orientation
Topic 6	dynam capabl, digit capabl, digit literacy, job satisfact, organiz learn	Dynamic and Digital Capabilities	Skills and capabilities related to digital transformation
Topic 7	firm perform, export perform, firm digit, data analyt, intern busi	Extrovert opportunities	Improve external connections and opportunities, related to business external environment
Topic 8	transform strategi, top manag, sme digit, digit strategi, digit innov	Strategic Transformation intensity	Discuss the existence of a transformation strategy from the management's side
Topic 9	human resourc, transform success, success determine, enabl factor,digit matur	Human Resource and Digital Maturity	Highlight the role of HR and maturity in digital evolution

Results presented in a word cloud in Figure 3. A word cloud is a visual representation of text data, where the frequency of each word is depicted by its size. This tool is particularly useful in academic research for identifying prominent themes, trends, and patterns within large datasets, thereby facilitating qualitative analysis. Additionally, word clouds can enhance the interpretability of textual information, making it easier to communicate complex data insights.

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(a)Publication year=2021 (b)Publication year=2022

Figure 3. Word cloud.

Figure 4 presents the bigram collocations from the above–mentioned analysis. Collocations are combinations of words that frequently co-occur in a language, appearing together more often than would be expected by chance. In our corpus. We examined the collocations of bigrams based on different grouping variable like the year of publication (e.g. 2021, 2022) and the origin of the first author (Europe, Asia and Other). We represented the collocation between the bigrams using a network representation. Each node of the network is a bigram and the edge represents the frequency of occurrence. In all cases, we used a window of five bigrams (before and after) to calculate the frequency,

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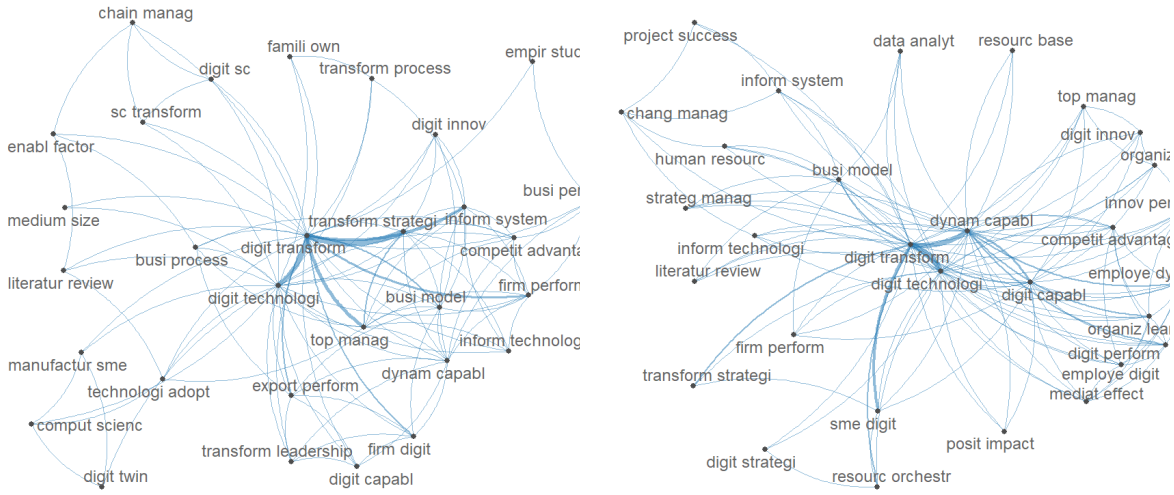

(c) Publication year=2023 (d) Publication year=2024

Figure 2 Collocation of bigrams for different publication years

4. Discuss and Conclusions

The systematic literature review (SLR) on the digital transformation of Small and Medium Enterprises (SMEs) provides a comprehensive understanding of the core elements that may accelerate and prevent SMEs from reaching a desirable level of digital maturity. Results support existing findings indicating that technological readiness is not a stand - alone aspect capable of guaranteeing successful digital transformation [74]. Several business - oriented aspects can facilitate or retard the whole procedure including leadership, resistance to change, organizational culture [75] and digital soft skills [76]. Of course, all these elements should be tailored to SMEs' specific conditions and restrictions taking into account industry specific characteristics, resource constraints and national differences [77,78].

The review identifies several enablers that facilitate the digital transformation of SMEs. A significant enabler that arise for the research is the support needed from external stakeholders, such as government policies and academic institutions. The role of supporting environments has been highlighted from previous researchers that described the consulting and practical role of public / governmental agencies and innovation laboratories [79,80]. Government initiatives can reduce financial barriers and provide the necessary infrastructure for digital transformation. Academic institutions play a crucial role in developing the skills and competencies required for digital transformation, thereby enhancing the capabilities of future employees and entrepreneurs. The adoption of emerging technologies is also pivotal in driving digital transformation. These technologies offer new opportunities for innovation and growth, enabling SMEs to stay competitive in a rapidly evolving market. These technologies offer tools and applications but moreover create a series of new digital channels disrupting traditional distribution boundaries [81], while providing new paths to extract information form customers and employees [82].

The review also highlights the importance of a digitally aligned strategy. A clear roadmap that outlines how and when to implement digital changes can provide all stakeholders with a shared vision and direction [83]. This strategy should prioritize investments not only in technology but also in people and processes, ensuring that the digital transformation efforts are holistic, agile and integrated [84]. The success of management's transformation to agile methodologies is crucial in this context, as it allows SMEs to respond quickly to market changes and customer needs, fostering a culture of continuous improvement and innovation.

Despite the numerous enablers, SMEs face several obstacles that hinder their digital transformation efforts. Limited financial resources are a significant barrier, as many SMEs struggle to afford the necessary investments in digital technologies. Additionally, a shortage of skilled personnel and competing priorities often lead to the neglect of digitization processes. Organizational

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culture is another critical obstacle. Resistance to change and a lack of digital skills among employees can impede the adoption of digital technologies. The complexity of digital transformation, which involves multiple interconnected systems across the enterprise, further compounds these challenges. SMEs often lack the expertise to manage this complexity, leading to implementation failures. Results support existing research that indicate as main barriers for digital transformation resource limitations, technical hurdles due to limited digital skills, lack of expertise to implement technologies and higher risk aversion [85–88]. These challenges can slow down the pace of digital transformation and limit the ability of SMEs to compete in global markets. Improving external connections and opportunities, such as forming strategic partnerships and expanding into new markets, can help SMEs overcome these barriers and enhance their digital capabilities.

The role of human resources and digital maturity is also emphasized in the review. Developing a digitally skilled workforce and fostering a culture of continuous learning are essential for successful digital transformation [89]. This includes providing training and development opportunities for employees, as well as creating an environment that encourages innovation and experimentation. The dynamic and digital capabilities of an organization, such as its ability to adapt to new technologies and processes, are critical for achieving digital maturity and sustaining competitive advantage.

In conclusion, the systematic literature review provides a comprehensive overview of the enablers and obstacles of digital transformation in SMEs. While there are numerous drivers that facilitate this process, significant barriers remain that need to be addressed. The COVID-19 pandemic has underscored the importance of digital resilience and highlighted the disparities in digital capabilities among SMEs. Future research should focus on providing empirical evidence on the relationship between digital transformation and organizational performance, exploring the role of digital entrepreneurship, and examining the long-term effects of digital transformation. By addressing these gaps, researchers can provide valuable insights that can help SMEs navigate the complexities of digital transformation and achieve sustainable growth.

Supplementary Materials: The information needed is included in the paper**.**

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