

# Barriers to Digital Transformation in SMEs: Insights from a Bibliometric Analysis

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## ABSTRACT

This paper presents a comprehensive bibliometric analysis of the current research landscape concerning digital transformation in Small and Medium-sized Enterprises (SMEs). Through a series of VOSviewer visualizations, we identify major thematic clusters, emerging research trends, unexplored opportunities, and patterns of author collaboration within the field. Our findings reveal a strong initial focus on crisis management in response to the COVID-19 pandemic, which gradually shifted towards long-term strategic issues such as business model innovation, digitalization strategies, and international market expansion. The analysis highlights under-researched areas including specific business processes and implications of digital transformation in the manufacturing sector, suggesting fruitful avenues for future research. Additionally, the study maps the collaboration networks among scholars, uncovering both strong interconnections and potential gaps that offer opportunities for new scholarly partnerships. This paper contributes to the strategic knowledge on digital transformation in SMEs by outlining the evolution of research themes over time and suggesting directions for future research collaborations to enhance the digital resilience and competitiveness of SMEs.

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## 1. INTRODUCTION

In recent years, Small and Medium-sized Enterprises (SMEs) have been pivotal to economic growth, especially in developing countries where they contribute significantly to employment and GDP. However, the rapid pace of technological change presents both opportunities and challenges for these businesses. Digital transformation, the integration of digital technology into all areas of business, has become a necessity rather

than an option. Yet, despite its potential to revolutionize business processes, many SMEs struggle with the adoption and implementation of digital technologies [1]–[4].

The barriers to digital transformation in SMEs are multifaceted and often interlinked. Financial constraints often top the list, as digital transformation requires substantial investment in technology and training. Beyond financial hurdles, there are organizational and cultural barriers as well.

Many SMEs lack the internal expertise necessary to implement and manage digital solutions, and resistance to change among staff can further hinder transformation efforts. Additionally, the regulatory and technological environments in many regions are not conducive to digital innovation, adding external pressures that complicate these initiatives [1], [5]–[8].

Bibliometric analysis offers a methodical approach to understanding the vast array of literature on this subject, identifying not only the most frequently cited research but also emerging trends and gaps in the field. By analyzing scholarly articles, conference proceedings, and other academic contributions, this approach helps synthesize complex information and provides a comprehensive overview of the research landscape. This insight is crucial for understanding the specific barriers faced by SMEs and the contextual factors influencing these obstacles [9]–[13].

Despite the recognized importance of digital transformation for SMEs, there remains a substantial gap in the comprehensive understanding of the barriers they face, which are often context-specific and vary widely between industries and regions. This gap in understanding hinders the development of effective strategies that could support SMEs in overcoming these barriers. Therefore, it is imperative to systematically review and synthesize the existing literature to identify and analyze the predominant barriers that prevent SMEs from successfully implementing digital transformation strategies.

The primary objective of this research is to systematically identify, categorize, and analyze the barriers to digital transformation in SMEs using a bibliometric analysis. This analysis aims to map out the key themes and trends over time, assess the impact of these barriers on the digital transformation process, and highlight the areas lacking in-depth research. This will enable a more structured and evidence-based understanding of the challenges SMEs face in digital transformation.

This research holds significant importance as it aims to provide stakeholders, including policymakers, business leaders, and academic researchers, with a clearer understanding of the barriers to digital transformation in SMEs. By highlighting the specific challenges and gaps in the literature, the findings can guide the development of targeted policies, strategies, and support mechanisms that are better suited to the needs of SMEs. Moreover, this study will contribute to the theoretical foundations of digital transformation by enhancing the understanding of its barriers in the context of SMEs, thus facilitating more effective and sustainable digital adoption strategies.

## 2. LITERATURE REVIEW

### 2.1 *Digital Transformation in SMEs*

Digital transformation refers to the integration of digital technology into all areas of a business, fundamentally changing how businesses operate and deliver value to customers. In the context of SMEs, digital transformation is often seen as a strategic move to enhance efficiency, market reach, and innovation capacity. [14] emphasizes that digital transformation can lead to significant competitive advantages but also poses substantial challenges, especially for smaller enterprises with limited resources. Studies by [15] suggest that while the potential benefits are vast, the adoption rates vary significantly due to diverse internal and external factors influencing SMEs.

### 2.2 *Barriers to Digital Transformation*

The literature identifies several key barriers that hinder the digital transformation efforts of SMEs. Financial constraints are frequently cited, as SMEs often lack the capital necessary to invest in new technologies and the associated training [16], [17]. Organizational resistance to change is another major barrier, where the existing culture and processes are deeply entrenched [18]. Technological challenges, such as the lack of technical expertise and infrastructural deficiencies, further exacerbate the problem,

limiting the ability of SMEs to seamlessly integrate new digital solutions [19], [20].

### 2.3 Bibliometric Analysis in Digital Transformation Research

Bibliometric analysis has emerged as a powerful tool in exploring extensive literatures and elucidating the evolution of research themes. In the field of digital transformation, bibliometric studies have been utilized to map out the scholarly landscape, revealing predominant research foci and identifying influential works and authors. A study by [21] utilized this method to track the progression and trends of digital transformation research, highlighting a growing emphasis on the need for sector-specific analysis due to the unique challenges and opportunities in different industrial contexts.

### 2.4 Gaps in Existing Literature

Despite the comprehensive coverage of barriers to digital transformation in general business research, there remains a notable gap in studies specifically focused on SMEs. Most existing research tends to generalize findings across business sizes and types, overlooking the unique challenges faced by smaller enterprises [22]. Furthermore, while some studies have addressed specific barriers such as financial and technical challenges, less attention has been paid to how these barriers interconnect and the compound effect they have on SMEs' ability to adopt digital technologies [23], [24].

## 3. METHODS

This study employs a bibliometric analysis to systematically review and synthesize existing literature on barriers to digital transformation in SMEs. Initially, a comprehensive database search will be conducted from Google Scholar, to collect relevant publications using keywords such as "digital transformation," "SMEs," "barriers," and "challenges." The search will be limited to articles published in English from 2009 to the present to capture the most recent trends and insights. The collected data will then be analyzed using VOSviewer software for

mapping and clustering of the literature to identify the most frequently discussed themes and the relationships between them. This will allow for the identification of major research trends, influential studies, and gaps in the existing literature. The findings will be presented through various bibliometric indicators such as co-citation analysis, co-authorship networks, and keyword co-occurrence, which will help in understanding the evolution of the field and the current state of research on the topic.

## 4. RESULTS AND DISCUSSION

### 4.1 Metrics Data of Literature

Table 1. Citation Metrics

Publication years:	2009-2024
Citation years:	15 (2009-2024)
Papers:	860
Citations:	35245
Cities/year:	2349.67
Cities/paper	40.98
Cities/author:	13642.54
Papers/author:	383.89
Authors/paper	2.87
h-index:	85
g-index:	170
hI, Norm	50
hI, annual	3.33
hA-index	53
Papers with ACC $\geq$ 1,2,3,10,20:	641,545,394,239,129

Source: Publish or Perish Output, 2024

Table 1 provides a comprehensive overview of citation metrics for a dataset spanning the years 2009 to 2024. Over these 15 years, a total of 860 papers were published, accumulating 35,245 citations. This results in an average of approximately 2,349.67 citations per year and 40.98 citations per paper, reflecting a robust engagement with the research within this field. The data also reveals an average of 13642.54 citations per author and 383.89 papers per author, indicating significant contributions from individual authors and a collaborative nature of research with an average of 2.87 authors per paper. The h-index for this dataset stands at 85, suggesting that 85 papers have each received at least 85 citations, which highlights

the impactful nature of the research. The g-index is even higher at 170, indicating that the top 170 papers have collectively garnered at least 28,900 citations. Other notable metrics include the hI, Norm of 50 and an hI, annual of 3.33, both of which adjust the h-index to account for multiple authors and annual productivity, respectively. The hA-index is calculated at 53, which is another derivative of

#### 4.2 Citation Analysis

Table 2. Top Cited Literature

Citation	Author	Title
1389	[25]	Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0
1193	[26]	A critical review of smart manufacturing & Industry 4.0 maturity models: Implications for small and medium-sized enterprises (SMEs)
893	[27]	The usage of digital marketing channels in SMEs
869	[28]	Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers
813	[29]	Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective
739	[30]	How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity
733	[31]	Industrial revolution-industry 4.0: Are German manufacturing SMEs the first victims of this revolution?
719	[32]	COVID-19 and digitalization: The great acceleration
708	[33]	Identifying digital transformation paths in the business model of SMEs during the COVID-19 pandemic
634	[34]	Digitalization, business models, and SMEs: How do business model innovation practices improve performance of digitalizing SMEs?

Source: Publish or Perish Output, 2024

Table 2 showcases the top cited literature related to digital transformation and Industry 4.0, specifically focusing on Small and Medium-sized Enterprises (SMEs), as sourced from Publish or Perish in 2024. The most cited work, by Müller, Buliga, and Voigt, explores how SMEs prepare and adapt business models for Industry 4.0, receiving 1389 citations, indicating its significant impact and relevance. Following this, Mittal and colleagues review smart manufacturing and Industry 4.0 maturity models, gathering 1193 citations, highlighting its critical insights for SMEs' technological advancements. Taiminen and Karjaluoto's examination of digital marketing usage in SMEs has also been well-received with 893 citations, reflecting the growing importance of digital channels in SME marketing strategies. Other notable

the h-index that accounts for author collaboration. Additionally, the breakdown of papers with at least 1, 2, 3, 10, and 20 citations shows a significant number of papers meeting these citation thresholds, with 641 papers receiving at least one citation, scaling down to 129 papers that have received at least 20 citations.

works include Coreynen et al.'s study on how digitization supports servitization in manufacturing, and Matarazzo et al.'s research on digital transformation in Italian SMEs, both emphasizing the dynamic capabilities and strategic adaptations needed to thrive in digitally-oriented markets. The literature spans a variety of themes from strategic approaches and digital capabilities to the specific challenges posed by COVID-19, showcasing the breadth of research focus and the diverse impacts of digital transformation on SMEs across different contexts.

### 4.3 Keyword Co-Occurrence Analysis

#### 4.3.1 Network Visualization

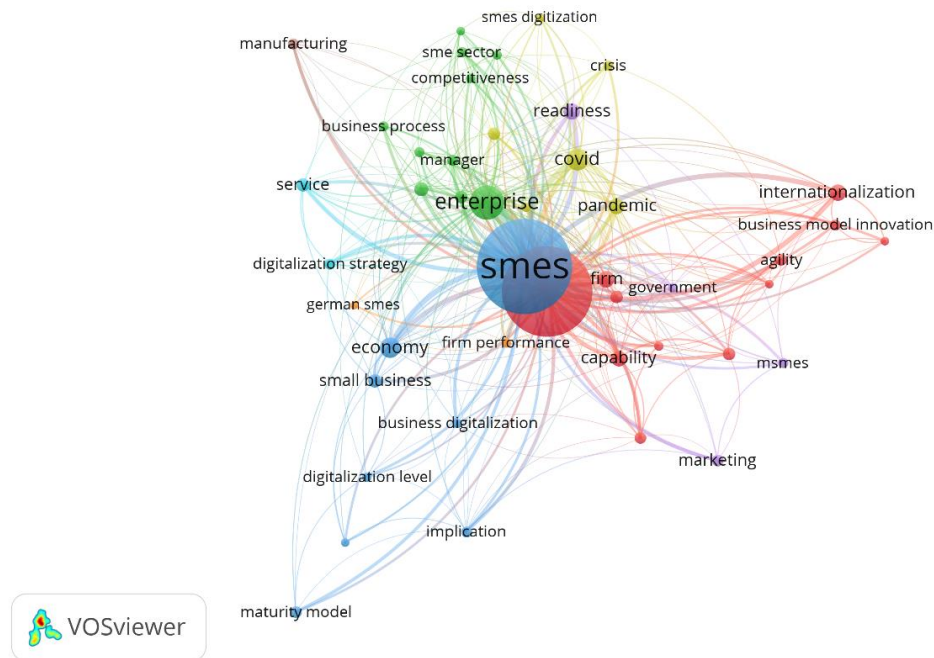


Figure 1. Network Visualization

Source: Data Analysis, 2024

The provided VOSviewer visualization maps the interconnected themes and keywords within the literature on digital transformation in Small and Medium-sized Enterprises (SMEs). This network analysis offers a graphical representation of the most prevalent and significant topics in the research field, highlighting their relationships and clustering into several thematic groups.

The keyword "SMEs" appears prominently at the center of the visualization, underscoring its importance as the focal point of the analyzed literature. Surrounding it are several closely related terms such as "enterprise," "firm," "capability," and "government," which indicate the various aspects of digital transformation discussions. The proximity of these terms suggests a strong correlation, likely exploring how SMEs' capabilities, influenced by governmental policies, affect their digital transformation journeys.

The visualization illustrates different clusters, each denoted by a unique color,

which represent thematic focuses within the research:

1. Red Cluster: This cluster includes keywords like "business model innovation," "agility," and "mismes," pointing to discussions on how SMEs need to innovate their business models and maintain agility to thrive in a digital economy. This cluster might be exploring the strategic and adaptive behaviors that enable SMEs to leverage digital technologies effectively.
2. Blue Cluster: Terms like "digitalization strategy," "German SMEs," and "maturity model" suggest a focus on strategic approaches to digitalization, the maturity levels of SMEs in adopting digital technologies, and possibly regional studies, particularly looking at German SMEs. This indicates a geographic specificity in the research, which could be examining the success

factors or challenges specific to SMEs in Germany or similar markets.

3. Green Cluster: Featuring terms like "manufacturing," "business process," and "service," this cluster likely addresses the operational aspects of digital transformation, discussing how manufacturing and service sectors within SMEs are adapting to digital changes. The emphasis on business processes suggests a focus on internal adjustments and enhancements needed to integrate new digital tools and methods.

#### 4.3.2 Overlay Visualization

The various interactions between these clusters and the central theme of SMEs reflect the multifaceted nature of digital transformation in small businesses. The lines connecting different keywords represent thematic overlaps, such as between "digitalization strategy" and "capability" or "business model innovation" and "agility," showing how strategic considerations are crucial for developing capabilities and innovating business models in response to digital trends.

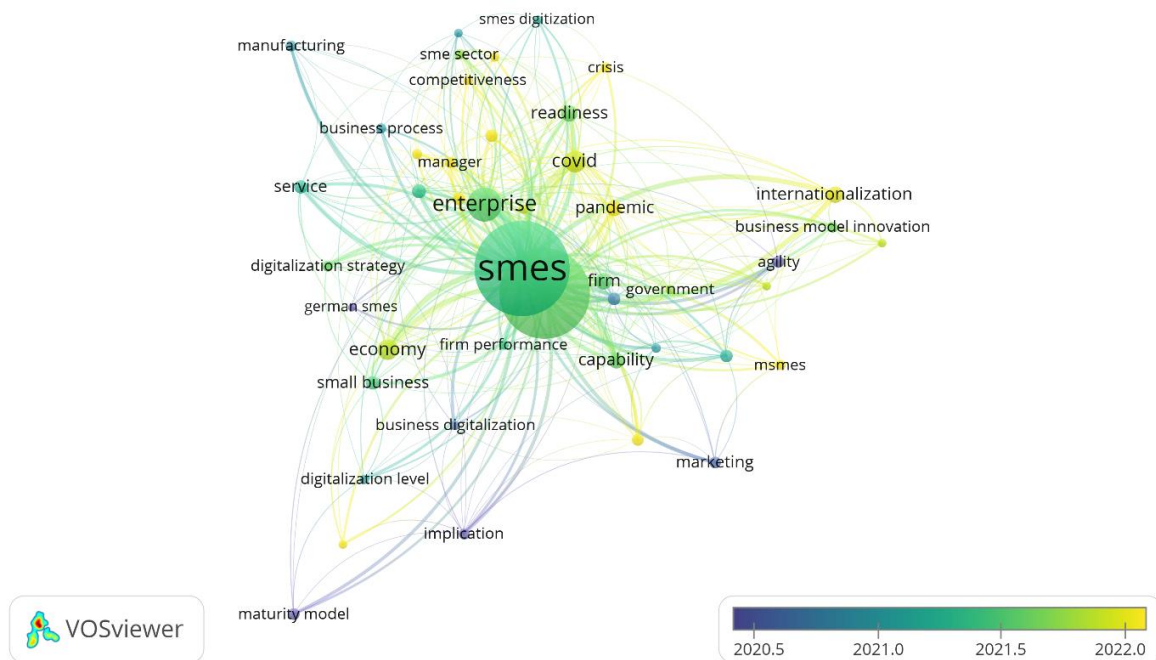


Figure 2. Overlay Visualization

Source: Data Analysis, 2024

This VOSviewer visualization, incorporating a temporal dimension, provides a dynamic overview of the trends and shifts in the focus of research related to digital transformation in SMEs. The visualization uses a color gradient to indicate the evolution of research themes from early 2020 to late 2022, shedding light on how priorities and research interests have shifted over time, particularly in response to external events like the COVID-19 pandemic.

In the early phases of 2020, the emphasis was notably on themes such as "readiness" and "crisis," reflecting the initial

impact of the COVID-19 pandemic on SMEs. Research during this period was likely driven by an urgent need to understand how SMEs were prepared to handle sudden disruptions and the immediate effects of the global crisis. The proximity of these themes to "COVID" and "pandemic" indicates a direct correlation with the pandemic's onset.

As the timeline progresses towards mid-2020 and into 2021, there is a visible shift towards more robust themes like "enterprise," "capability," and "government." This suggests a transition in research focus towards how SMEs can build resilience and adaptability

through enhancing capabilities and leveraging government support. This period likely marks an increasing interest in understanding and documenting the strategies that SMEs employed to mitigate the pandemic's impacts and the role of government policies in facilitating these adaptations.

By late 2021 and into 2022, the focus appears to shift towards long-term strategies like "business model innovation" and "digitalization strategy." This indicates a maturation of research interests towards sustainable practices and the integration of digital technologies into core business processes. The emphasis on "marketing" and

#### 4.3.3 Density Visualization

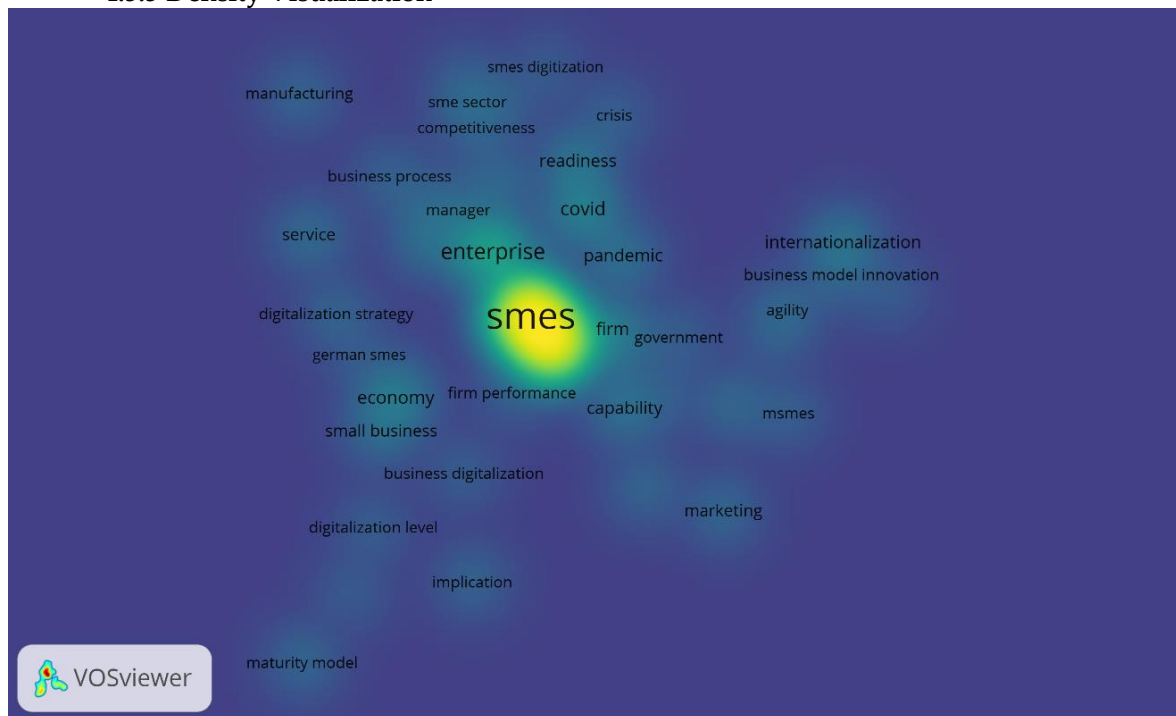


Figure 3. Density Visualization

Source: Data Analysis, 2024

This VOSviewer visualization provides a snapshot of the distribution and interconnectivity of key research topics related to Small and Medium-sized Enterprises (SMEs) and their digital transformation. The color gradient, ranging from bright green at the center to a darker blue at the edges, signifies the concentration and relative saturation of research within different areas.

At the center of the visualization, bright green nodes such as "SMEs,"

"internationalization" during this later period highlights a growing interest in how digital transformation can aid SMEs in expanding their market reach and competitiveness on a global scale.

Themes such as "business model innovation" and "agility" gain prominence over time, reflecting an ongoing interest in how businesses pivot and adapt to new economic realities and technological advancements. Early emphasis on "crisis" management seems to wane, suggesting a potential stabilization or a shift in research focus from immediate crisis response to long-term strategic planning and recovery.

"enterprise," "capability," and "firm" indicate these are well-established areas of research with significant academic attention. These themes are likely to have a rich body of literature and well-developed theoretical frameworks. The presence of "COVID" and "pandemic" near the center suggests a recent influx of research focusing on the impact of global crises on SME digital transformation.

The darker blue regions at the periphery of the visualization suggest less concentration of research activity. For



instance, "manufacturing," "business process," "digitalization level," and "implication" appear as less brightly lit, indicating that these might be less explored in the context of SME digital transformation. This observation points to potential research opportunities:

1. Manufacturing, there seems to be a relative gap in studies focusing specifically on the manufacturing sector within SMEs, especially in how these businesses are leveraging digital technologies to enhance production processes, supply chain management, and product innovation.
2. Business process, while there is extensive research on broader digital transformation strategies, there might be room for more detailed exploration of specific business processes in SMEs, such as customer relationship management, inventory control, and human resources, particularly in how digital tools are integrated into these areas.
3. Digitalization level, the specific stages or levels of digitalization within SMEs appear to be underexplored. Research could focus on developing models or metrics to assess the digital maturity of SMEs,

which can help in benchmarking and guiding digital strategy development.

4. Implication, the implications of digital transformation in terms of regulatory compliance, environmental impact, and social responsibility in the SME context might also represent an under-researched area. Studies could investigate how SMEs navigate the complexities of regulatory frameworks in digital undertakings or how digital transformation influences their social and environmental footprints.

The darker, less bright areas in the VOSviewer visualization not only indicate the potential for novel research contributions but also suggest that these areas might benefit from a more detailed, nuanced analysis. By focusing on these less saturated themes, future research can offer fresh insights and practical implications, potentially guiding policy-making, strategy development, and operational enhancements in SMEs. This approach would help fill existing gaps and contribute to a more comprehensive understanding of the multifaceted nature of digital transformation in small and medium enterprises.

**4.3.4 Co Author Analysis**

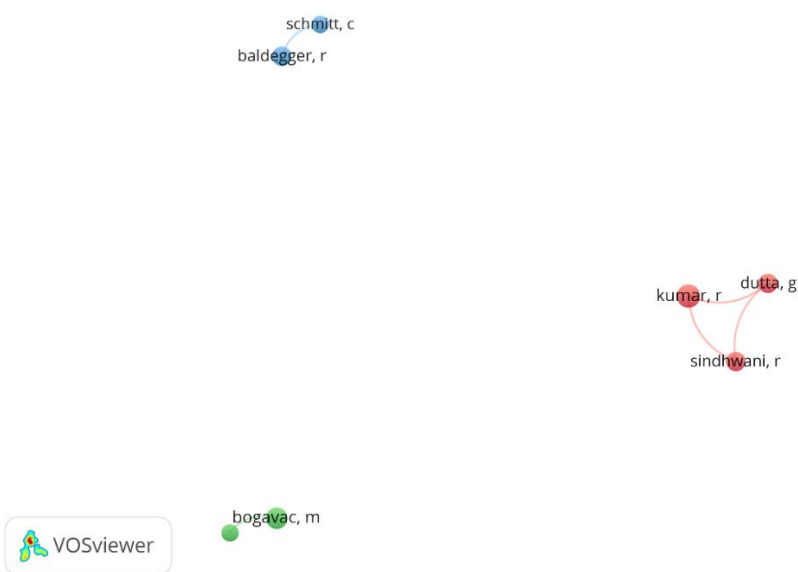


Figure 4. Author Network Visualization

Source: Data Analysis, 2024



This VOSviewer visualization represents a network of authors and their collaboration patterns within a specific research domain. The nodes (each representing an author) are connected by lines that signify co-authorship relationships, indicating that these researchers have worked together on at least one publication. The size of each node might typically represent the number of publications or citations an author has, although in this visualization, node sizes appear uniform, suggesting focus solely on the relationships rather than individual productivity metrics.

Red cluster includes authors Kumar, R., Dutta, G., and Sindhwani, R., all of whom are closely connected, indicating a strong collaboration among them. This tight cluster suggests these authors likely share a common research focus or have been part of a research project or series of publications together. The author Bogavac, M., stands alone without connections to other nodes in this visualization, suggesting that this researcher either works independently or their co-authors are not included within the scope of this dataset. Similar to the green cluster, authors Schmitt, C., and Baldegger, R., are positioned apart from the central cluster but close to each other, hinting at a possible collaboration between them that is distinct from the collaborations observed in the red cluster.

The visualization offers insights into the collaborative dynamics within the research community it represents. The existence of a tightly knit cluster alongside isolated authors might indicate areas of concentrated research expertise and potential gaps or opportunities for cross-collaborative research efforts. Researchers within isolated

nodes might benefit from connecting with the established network to expand their research impact and explore new interdisciplinary avenues.

## 5. CONCLUSION

The analysis of the VOSviewer visualizations across different dimensions of research on SME digital transformation and author collaboration reveals insightful trends and opportunities. Thematic clusters identify core areas such as business model innovation, digitalization strategies, and the impact of external events like the COVID-19 pandemic, emphasizing the dynamic nature of the field. Research trends indicate a shift from crisis management at the onset of the pandemic to a focus on long-term strategies like internationalization and digital maturity, suggesting a maturation of research interests toward sustainable and growth-oriented goals. Opportunities for new research were identified in less explored areas such as the implications of digital transformation, specific business processes within SMEs, and manufacturing sector challenges, which are critical for further expanding our understanding of digital transformation in SMEs. Lastly, the author collaboration network points to both robust partnerships and potential gaps in collaboration that could benefit from increased interdisciplinary integration, highlighting areas where new research collaborations could be particularly impactful. Collectively, these insights not only enhance our understanding of the current research landscape but also guide future scholarly efforts to address emerging challenges and opportunities within the realm of SME digital transformation.

## REFERENCES

- [1] K. Liu, "A Three-dimensional Model of Digital Transformation for Small and Medium-sized Enterprises," *J. Innov. Dev.*, vol. 3, no. 2, pp. 112–118, 2023.
- [2] S. Lokuge and S. X. Duan, "Exploring the enablers of digital transformation in small and medium-sized enterprises," *Handb. Res. Bus. Model Innov. Through Disrupt. Digit.*, pp. 136–156, 2023.
- [3] C. S. de Mattos, G. Pellegrini, G. Hagelaar, and W. Dolfsma, "Systematic literature review on technological transformation in SMEs: a transformation encompassing technology assimilation and business model innovation," *Manag. Rev. Q.*, pp. 1–39, 2023.
- [4] A. A. Jaish, R. Murdipi, D. A. Razak, and N. M. Alwi, "The Effect of Digitalization on the Sustainability of Malaysian SMEs," *Int. J. Acad. Res. Bus. Soc. Sci.*, vol. 13, no. 1, pp. 655–668, 2023.

- [5] A. S. Karikova, "Overcoming the barriers to the digital transformation of industrial enterprises through the business model selection mechanism," *Strateg. Decis. risk Manag.*, vol. 14, no. 1, pp. 74–85, 2023.
- [6] K. Uzule and N. Verina, "Digital barriers in digital transition and digital transformation: Literature review," *Econ. Cult.*, vol. 20, no. 1, pp. 125–143, 2023.
- [7] Y. Yunrong, "Opportunities and Challenges of Enterprise Digital Transformation," *BCP Bus. Manag.*, no. 1, pp. 112–124, 2023.
- [8] L. Dörr, K. Fliege, C. Lehmann, D. K. Kanbach, and S. Kraus, "A taxonomy on influencing factors towards digital transformation in SMEs," *J. Small Bus. Strateg.*, vol. 33, no. 1, pp. 53–69, 2023.
- [9] M. Castillo-Vergara, V. Muñoz-Cisterna, C. Geldes, A. Álvarez-Marín, and M. Soto-Marquez, "Bibliometric Analysis of Computational and Mathematical Models of Innovation and Technology in Business," *Axioms*, vol. 12, no. 7, p. 631, 2023.
- [10] D. R. S. Saputro, H. Prasetyo, A. Wibowo, F. Khairina, K. Sidiq, and G. N. A. Wibowo, "BIBLIOMETRIC ANALYSIS OF NEURAL BASIS EXPANSION ANALYSIS FOR INTERPRETABLE TIME SERIES (N-BEATS) FOR RESEARCH TREND MAPPING," *BAREKENG J. Ilmu Mat. Dan Terap.*, vol. 17, no. 2, pp. 1103–1112, 2023.
- [11] K. H. Abdullah, M. F. Roslan, N. S. Ishak, M. Ilias, and R. Dani, "Unearthing hidden research opportunities through bibliometric analysis: a review," *Asian J. Res. Educ. Soc. Sci.*, vol. 5, no. 1, pp. 251–262, 2023.
- [12] A. K. Maharana and S. Pal, "Application of Bibliometric Analysis in the Study of Climate Change and Sustainable Development Practices," *Int. J. Environ. Clim. Chang.*, vol. 13, no. 6, pp. 361–368, 2023.
- [13] M. K. Lazarides, I.-Z. Lazaridou, and N. Papanas, "Bibliometric analysis: Bridging informatics with science," *Int. J. Low. Extrem. Wounds*, p. 15347346231153538, 2023.
- [14] G. Vial, "Understanding digital transformation: A review and a research agenda," *Manag. Digit. Transform.*, pp. 13–66, 2021.
- [15] N. Etienne Fabian, J. Q. Dong, T. Broekhuizen, and P. C. Verhoef, "Business value of SME digitalisation: when does it pay off more?," *Eur. J. Inf. Syst.*, pp. 1–20, 2023.
- [16] S. Nadkarni and R. Prügl, "Digital transformation: a review, synthesis and opportunities for future research," *Manag. Rev. Q.*, vol. 71, pp. 233–341, 2021.
- [17] I. M. A. Suwandana, N. N. Yuliarmi, I. G. W. M. Yasa, and P. A. P. Purwanti, "Business Resilience and Quality of Life of Timber Smes During the COVID-19 Pandemic in Badung Regency," *Int. J. Prof. Bus. Rev.*, vol. 8, no. 10, pp. e03802–e03802, 2023.
- [18] A. Hanelt, R. Bohnsack, D. Marz, and C. Antunes Marante, "A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change," *J. Manag. Stud.*, vol. 58, no. 5, pp. 1159–1197, 2021.
- [19] L. Li, F. Ye, Y. Zhan, A. Kumar, F. Schiavone, and Y. Li, "Unraveling the performance puzzle of digitalization: Evidence from manufacturing firms," *J. Bus. Res.*, vol. 149, pp. 54–64, 2022.
- [20] I. W. P. S. Aryana, I. M. A. Suwandana, and G. Sumarda, "PKM PENGEMBANGAN TEKNOLOGI PRODUKSI DAN PEMASARAN BERBASIS DIGITAL PADA UKM PENGRAJIN BESI UD PANDE DJEGOG DI KELURAHAN PENATIH DENPASAR TIMUR," *E-Amal J. Pengabd. Kpd. Masy.*, vol. 2, no. 1, pp. 833–838, 2022.
- [21] I. Mergel, A. Guenduez, G. Maragno, A.-L. Schumann, and J. Kühler, "Understanding the Past and Future of the Digital Transformation of Library Services," *Available SSRN 4841812*.
- [22] K. S. Osmundsen, "Gather your employees: Digital transformation in incumbent firms-Insights from the Norwegian grid sector," 2021.
- [23] A. Caputo, S. Pizzi, M. M. Pellegrini, and M. Dabić, "Digitalization and business models: Where are we going? A science map of the field," *J. Bus. Res.*, vol. 123, pp. 489–501, 2021.
- [24] Y. Priyana, "Implementation of President Grants for Micro Business Productive (BPUM) to Increase Productivity of MSMEs Amid Adaptation of New Normal: A Research Proposal," in *International Conference on Economics, Management and Accounting (ICEMAC 2021)*, Atlantis Press, 2022, pp. 324–328.
- [25] J. M. Müller, O. Buliga, and K.-I. Voigt, "Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0," *Technol. Forecast. Soc. Change*, vol. 132, pp. 2–17, 2018.
- [26] S. Mittal, M. A. Khan, D. Romero, and T. Wuest, "A critical review of smart manufacturing & Industry 4.0 maturity models: Implications for small and medium-sized enterprises (SMEs)," *J. Manuf. Syst.*, vol. 49, pp. 194–214, 2018.
- [27] H. M. Taiminen and H. Karjaluo, "The usage of digital marketing channels in SMEs," *J. small Bus. Enterp. Dev.*, vol. 22, no. 4, pp. 633–651, 2015.
- [28] W. Coreynen, P. Matthyssens, and W. Van Bockhaven, "Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers," *Ind. Mark. Manag.*, vol. 60, pp. 42–53, 2017.
- [29] M. Matarazzo, L. Penco, G. Profumo, and R. Quaglia, "Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective," *J. Bus. Res.*, vol. 123, pp. 642–656, 2021.
- [30] J. Cenamor, V. Parida, and J. Wincent, "How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity," *J. Bus. Res.*, vol. 100, pp. 196–206, 2019.
- [31] L. Sommer, "Industrial revolution-industry 4.0: Are German manufacturing SMEs the first victims of this revolution?," *J. Ind. Eng. Manag.*, vol. 8, no. 5, pp. 1512–1532, 2015.
- [32] J. Amankwah-Amoah, Z. Khan, G. Wood, and G. Knight, "COVID-19 and digitalization: The great acceleration," *J. Bus. Res.*, vol. 136, pp. 602–611, 2021.
- [33] A. Priyono, A. Moin, and V. N. A. O. Putri, "Identifying digital transformation paths in the business model of SMEs

- during the COVID-19 pandemic," *J. Open Innov. Technol. Mark. Complex.*, vol. 6, no. 4, p. 104, 2020.
- [34] H. Bouwman, S. Nikou, and M. de Reuver, "Digitalization, business models, and SMEs: How do business model innovation practices improve performance of digitalizing SMEs?," *Telecomm. Policy*, vol. 43, no. 9, p. 101828, 2019.