

Mapping Research Trends in Digital Technology Adoption among SMEs: A Bibliometric Study

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ABSTRACT

The increasing importance of digital technologies has drawn the scholarly attention to how micro and small enterprises (MSEs) adopt digital tools into their business operations. However, Existing literature remains fragmented across themes including technology adoption, digital transformation, and information and communication technology (ICT) implementation. This study aims to examine the literature related to digital adoption in micro and small enterprises by conducting a bibliometric analysis of the digital adoption of small and medium enterprises literature. A total of 97 peer-reviewed articles published between 2010 and 2025 were retrieved from web of science database. Using Biblioshiny software performance analysis and science mapping techniques were applied, including publication trends, leading authors, influential journals and major contributing countries analysis. Moreover, keyword frequency and co-occurrence analyses were conducted to explore the main research themes and their interconnections. The finding reveals a steady increase in scholarly output over recent years, reflecting the growing relevance of digital adoption for small business competitiveness. The analysis further highlights the dominance of themes such as technology adoption, innovation, and SME performance within the literature. By mapping the key contributors, thematic developments, and influential studies in this filed, the study provides a comprehensive overview of the current research focus areas and offers directions for future research on digital adoption in micro and small enterprises.

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1. INTRODUCTION

Adoption of digital technologies has emerged as strategic components for micro and small enterprises globally. Recent publications evidenced performance improvement contribution of integrating digital tools into small business process (Al-soufi et al., 2025; Kallmuenzer et al., 2025; Wang, 2020).

According to (OECD, 2020) Digital adoption fundamentally represents the process by which enterprises integrate digital technologies into their business operations and strategic decision-making. This might include uptake of basic technologies like websites and e-commerce platforms, as well as more advanced digital systems such as cloud computing, analytics, mobile services. In line with this concept and built on traditional digital adoption theories growing number of scholars investigates multiple dimensions of digital adoption in the context of micro and small enterprises. For instance, the study by (Marino-Romero, Palos-Sanchez, et al., 2024; Shahadat et al., 2023; Yuwono et al., 2024) reported the multifaced nature of digital adoption. Organizational readiness and external environmental factors shape adoption outcomes.

Despite these insights the literature on digital adoption in micro and small enterprises remains fragmented. While some studies (Faiz et al., 2024) integrates Technology-Organization and Environment (TOE) with Diffusion of innovation (DOI) to study varies determinants of digital technology adoption in SMEs, others applied TOE to specific technologies such as socio commerce and cloud computing (Abed, 2020; Gui et al, 2020). Still some others take a broader view of digitalization and ICT adoption, synthesizing diverse operational definitions in conducting systematic study (Gutiérrez Navas et al., 2025; Yuwono et al., 2024).

However, the progressive status of the current bibliometric based investigation the following three relevant gaps from existing studies justifies the necessity for conducting

further bibliometric study. The first, is existing bibliometric study mainly focus on digital transformation and few considerations to specific digital adoption dimension(Vu, 2024), the second, is narrow thematic representation, limiting their scope to specific technologies such as E-commerce and ICT(Boonmee et al., 2025; Kumar & Sudhakar, 2024; Proietti & Magnani, 2025), and finally, although the growing literature has used Scopus and mixed datasets, bibliometric analysis based solely on web of science extracted data is a few. In response to the identified conceptual gaps, theoretical heterogeneity, and the fragmented nature of this emerging research domain, a bibliometric analysis offers a systematic and insightful approach to synthesizing existing knowledge. As highlighted by (Donthu et al., 2021) bibliometric methods enable scholars to uncover the intellectual structure of a filed, and identify thematic evolution. Therefore, this study addresses the following research questions, namely the publication trends in digital adoption among micro and small enterprises, the most productive and influential authors, journals, and countries, the collaboration patterns among authors and institutions, as well as the major thematic clusters and emerging research fronts.

2. LITERATURE REVIEW

Digital Transformation and Adoption in SMEs: Intellectual Foundations

Recent years have witnessed a notable expansion of scholarly interest in the digital transformation of small and medium-sized enterprises. For instance, (Elsa et al., 2025) Conducted a bibliometric mapping on global research on digital transformation in SMEs using data file from Scopus-indexed data bases. Employing Biblioshiny and VOS viewer the authors examined thematic evolution, keyword co-occurrence, and citation structures to uncover dominant research

streams. Their findings conceptualize digital transformation as a multidimensional journey shaped by leadership capabilities, organizational readiness, innovation ecosystems and collaborative networks. Similarly, (Marino-Romero, Palos-Sánchez, et al., 2024), analyzed the evolution of digital transformation in SME management using data extracted from the web of science. Their result indicate that the discourse is primarily focused within strategic management, innovation performance, and sustainability debates. However, they underline the limited attention to the internal process of digital adoption in the current literature. Their thematic evolution further highlights growing scholarly engagement with artificial intelligence, digital ecosystem, and data-driven business models. In parallel, (Hafeez et al., 2025) conducted a structured review of knowledge management and SMEs digital transformation. Combining both theoretical and empirical contributions, the study identifies human capital development and knowledge integration as central drivers of transformation. Additionally, the authors underscore the fragmented and dispersed nature of research specifically addressing digital transformation in micro and small enterprises. Taken together, the preceding review and from prior studies such as, (Ferreira et al., 2019; Kraus et al., 2022) predominantly conceptualize digital transformation at an aggregate level, emphasizing thematic domains, strategic trajectories, and performance implications. However, these contributions do not explicitly disclose *digital adoption* processes within micro and small enterprises.

Bibliometric perspective on Digital Adoption Research

Bibliometric analyses further demonstrate the exponential growth of research on digital adoption and transformation in SMEs. For instance, (Baojing et al., 2024) mapped that

since 2014, particularly in the post-covid-19 period. Their thematic cluster highlights industry 4.0, digital capabilities, and innovation management as dominant domains. The study also suggest that digital transformation has become central to discussions of SME resilience and competitiveness. Likewise, (Petropoulou et al., 2024) Report significant growth in post pandemic research output, with particular emphasis on the internet of things (IoT), Cloud computing and e-commerce. In global bibliometric review, (Mohamad marzuki et al., 2023) observe that previous research primarily centers on digital transformation, particularly information and communication technology and SMEs. Further study by (Aulia et al., 2025), extending this work identify strong interconnections among studies and highlight emerging research gaps, providing structured foundation for advancing digital business strategy scholarship. Similarly, (Nurul et al., 2026a) conducted bibliometric mapping using advanced R-based tools, revealing that manufacturing and construction represent the most extensively studied streams, while the United States emerges as the leading contributor to digital transformation research. Collectively, these studies confirm that research on digital adoption and transformation within the SME domain expanding rapidly, characterized by thematic diversification and mixed methodological approaches. However, in line with the above review the following limitations remain evident.

First, most previous bibliometric analyses rely predominantly on Scopus-based datasets, with limited inclusion of other databases such as web of science, second, keyword strategies are often narrowly framed around terms such as “digital transformation”, “Industry 4.0” “SMEs”, (Nurul et al., 2026b; Zhou et al., 2025), These risks excluding literature explicitly framed around: “Technology adoption”, “ICT

adoption", "Small firms" and "Small businesses". Third, many studies remain descriptive in nature focusing primarily on publication counts, citation analysis, and keyword co-occurrence without sufficiently integrating adoption-oriented theoretical context. Addressing these gaps this study introduces three important strands of innovativeness. The first strand is Inclusive and Multi-Dimensional Keyword Strategy that contains conceptually broader and more integrative than prior studies, the second strand is reliance on the web of science extracted data file, while many prior studies rely merely on Scopus (Ira Syazwani Mohamad et al., 2023) and the third strand is additional emphasis on Digital Adoption, while previous focus was only on Digital transformation of SMEs.

3. METHODOLOGY

Data source and Search strategy

Data were retrieved from web of science core collection on 26 December 2025. The database was selected because of its structured indexing system and comprehensive cited reference records, which are particularly suitable for citation-based analysis and mapping the intellectual structure of a research field (Dönmez, 2024) (Aransyah et al., 2025). The search string used was: TITLE-ABS-KEY ("digital*" OR "technology adoption" OR "ICT adoption") AND ("SME*" OR "small and medium enterprise*" OR "small firm*" OR "small business*"). The search yielded 196 initial records.

Inclusion And Exclusion Criteria

The following inclusion criteria were applied: (a) publication period was restricted to studies published between 2010 and 2025, (b) Subject areas limited to Management, Business Economics, Business Finance, Operations Research and Management Science, Social Sciences Interdisciplinary, Development Studies, and Public Administration; (c) A language filter

written in English only; (d) containing "social enterprise" or "social entrepreneurship" in title, abstract, or keywords. Exclusion criteria were: (a) conference proceedings, book chapters, editorials, and errata; (b) duplicate records; (c) documents without author or citation information. After screening, 1,247 documents were retained for analysis.

The selection process—including identification, screening, eligibility assessment, and final inclusion—is summarized in the PRISMA 2020 flow diagram presented below.

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Table 1. Prisma Flowchart-Study Selection Process.

PHASE	STEP	RECORDS(n)
Identification	Records identified from web of science	196 documents found
Screening (automated)	Records after applying year filter (2010-2025)	166 documents found
	Records after limiting to subject areas	97 documents
	Records after filtering language (only English)	97 documents
	Total screened document web of science	97 documents
Included	Records included in bibliometric analysis	97 documents

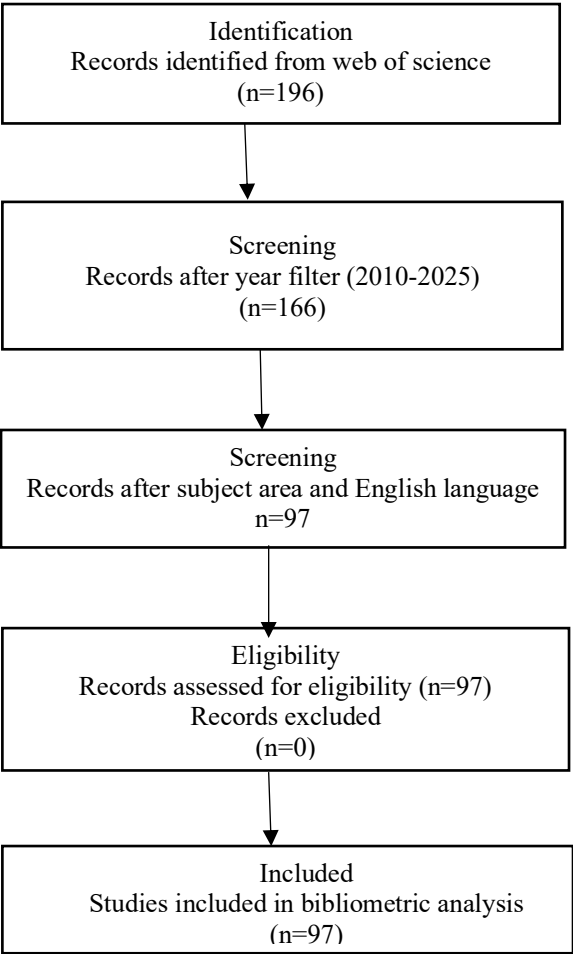


Figure 1. Prisma Flowchart selection process.

Data analysis tools and Techniques

Biblioshiny (the web interface of Bibliometrix R-package) was used for descriptive analysis, annual scientific production, and three-field plots.

4. RESULT AND DISCUSSION

The final dataset comprised 97 documents published between 2010 and 2025. Figure 1, illustrates the main information section of the extracted data file. Accordingly, the dataset covers publications from, comprising published across 55 sources and authored by 301 researchers. The field shows a strong annual growth rate of 17.68%, with an average of 3.22 co-authors per document and a high level of international collaboration (42.27%). The documents cite 7,231 references, have an average age of 5.23

years, and receive an average of 41.69 citations per document, indicating sustained research impact and collaborative scholarly activity.



Figure 2. Main information

(Source: Author’s computation using Biblioshiny)

Figure 2, presents the annual scientific production from 2010 to 2025. Overall, publication output shows a gradual upward trend with minor fluctuations in the early years, followed by a marked increase after 2017. A substantial growth is observed from 2021 onward, reaching a peak in 2025, indicating rising research interest and increased scholarly output in the field.

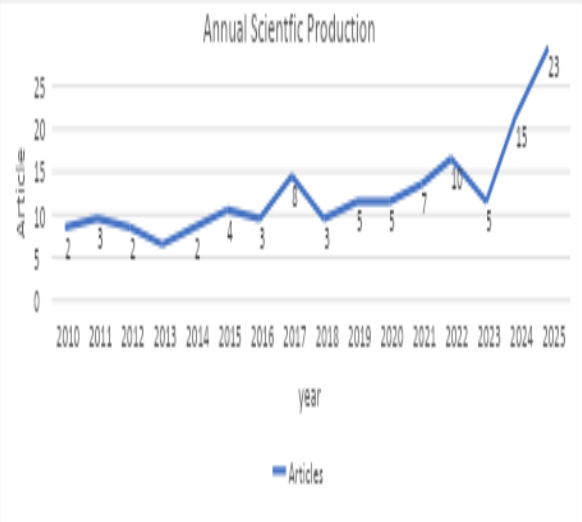


Figure 3. Annual Scientific Production

(Source: Author’s computation using Biblioshiny)

Figure 3, outlines the annual citation trend revealing fluctuation yet evolving pattern, citations remain relatively low with minor variations, between 2010 and 2013 indicating limited but emerging scholarly

attention. Between 2014 and 2017, citation fluctuate at a moderately higher level rather than following a steady upward trajectory. A noticeable decline occurs in 2018, followed by a sharp steady growth peak in 2020, reflecting intensified research period. After 2020, citation counts decline but stabilize above the level observed in the initial years. Suggesting the sustained academic interest. Generally, the trend reflects early exploration, mid-period variability, a significant expansion phase, and subsequent stabilization of research activity.

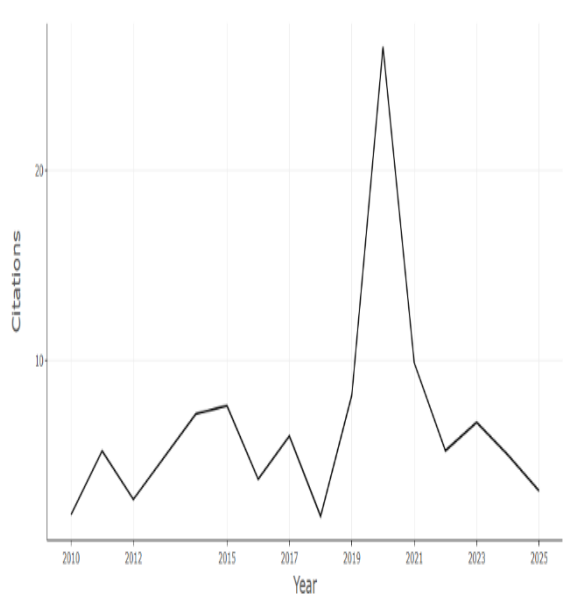


Figure 4. average citation per year
(Author's computation using Biblioshiny)

Figure 4's three-field plot reveals the intellectual structure of digital adoption research in SMEs. Foundational works—Rogers (1995) on diffusion of innovations, Davis (1989) on technology acceptance, and Tornatzky and Fleischer (1990) on the TOE framework—form the theoretical backbone. These references link to leading authors (Salleh, Ahmad, Sepasgozar, Loosmore). Dominant keywords include technology adoption, innovation, SMEs, ICT adoption, management, performance, diffusion, and digital transformation. The connections show how a small group of influential authors bridges

foundational references to contemporary themes. Thematic focus converges around technology adoption, innovation, ICT adoption, performance, digital transformation, and implementation. Overall, SME digitalization research is strongly grounded in innovation diffusion and technology acceptance theories, with growing emphasis on performance outcomes and digital transformation.

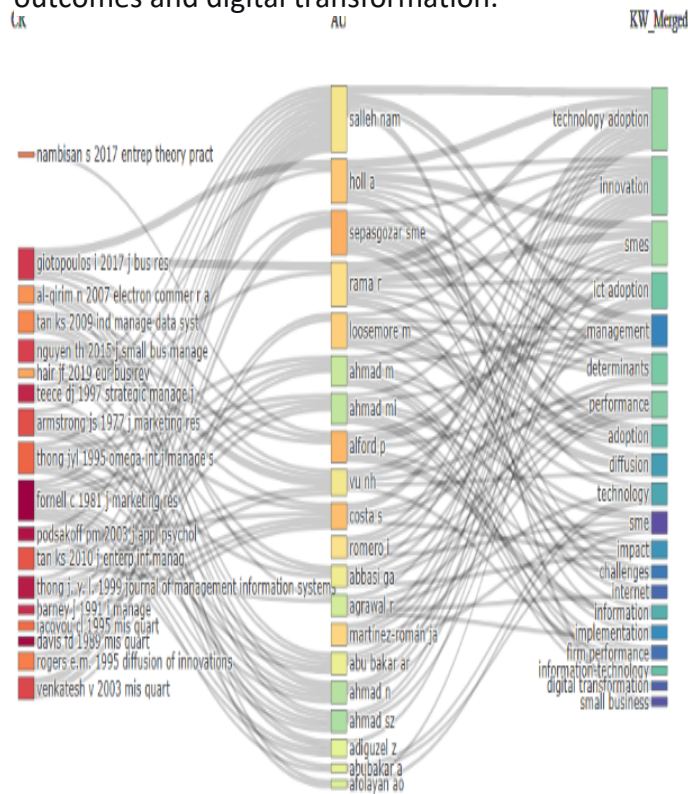


Figure 5. Three filed plots
(Author's computation using Biblioshiny)

Figure 5 maps the most productive publication sources by number of articles. The Journal of Small Business Management leads with 11 articles, followed by Small Business Economics with 8, showing strong concentration in SME-focused journals. A second tier—Information Technology for Development and the International Small Business Journal—reflects the growing intersection of small business research with technology and entrepreneurship. Overall, the literature is anchored in core small business journals but also spans innovation, technology management, and business process research, underscoring the field's interdisciplinary nature.

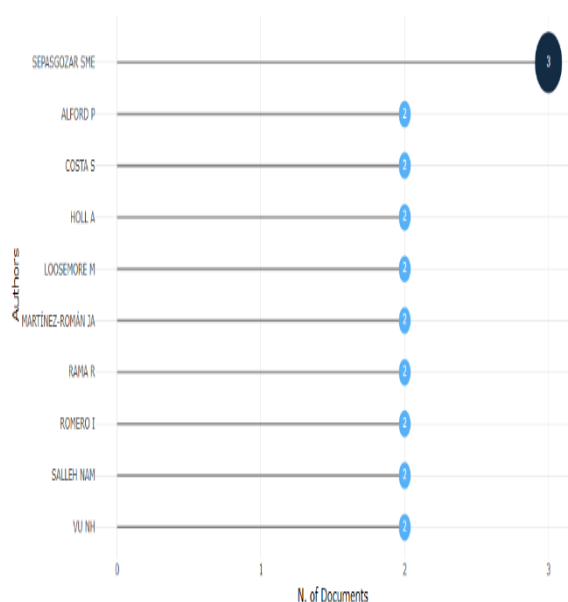


Figure 9. Most relevant Author

(Source: Author's computation using Biblioshiny)

The figure9, illustrates the trend in average citations per year from 2010 to 2025. Citation impact increases steadily in the early years, with noticeable peaks around 2011–2015 and a pronounced maximum in 2020, indicating highly influential publications during that period. After 2020, average citations decline, reflecting the shorter citation window of more recent publications. Overall, the figure highlights temporal variations in citation performance, with older publications accumulating higher average citations than newer ones.

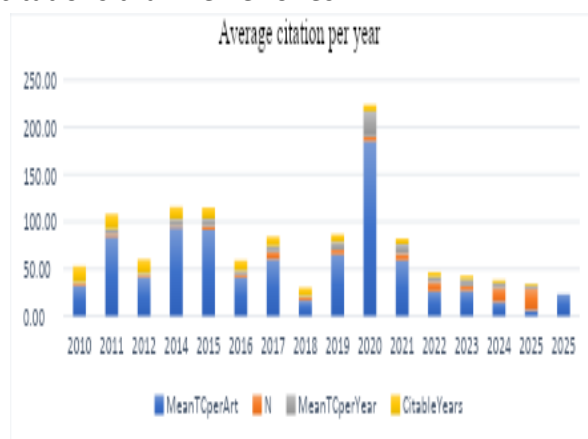


Figure 10. Average citation per year

(Source: Author's computation using Biblioshiny)

Figure 10, displays the most productive institutional affiliations contributing to research on digital adoption in SMEs, measured by the number of published articles. The University of New South Wales Sydney leads with five publications, followed by the Consejo Superior de Investigaciones Científicas (CSIC) and the University System of Georgia, each with four articles. Several institutions—including Foreign Trade University (FTU), Queensland University of Technology (QUT), Universidade do Minho, University of Padua, and University of Turin—each contributed three publications, while American University of Armenia and Consiglio Nazionale delle Ricerche (CNR) recorded two articles each. Overall, the distribution indicates geographically diverse institutional engagement, with contributions concentrated among a small group of leading universities and research organizations.

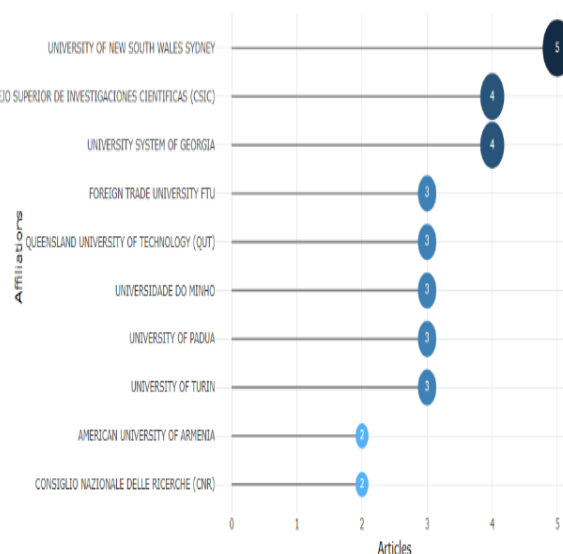


Figure 11. Most relevant affiliation

(Source: Author's computation using Biblioshiny)

Figure 11 presents the most relevant journals by number of published articles. The *Journal of Small Business Management* leads, followed by *Small Business Economics*, confirming strong emphasis on SME-focused research. Other outlets—*Information Technology for*

Development, International Small Business Journal, and journals in innovation, entrepreneurship, and strategic management—contribute moderately. Overall, the literature is concentrated in core SME and management journals, while also spanning innovation, technology, and development-oriented sources.

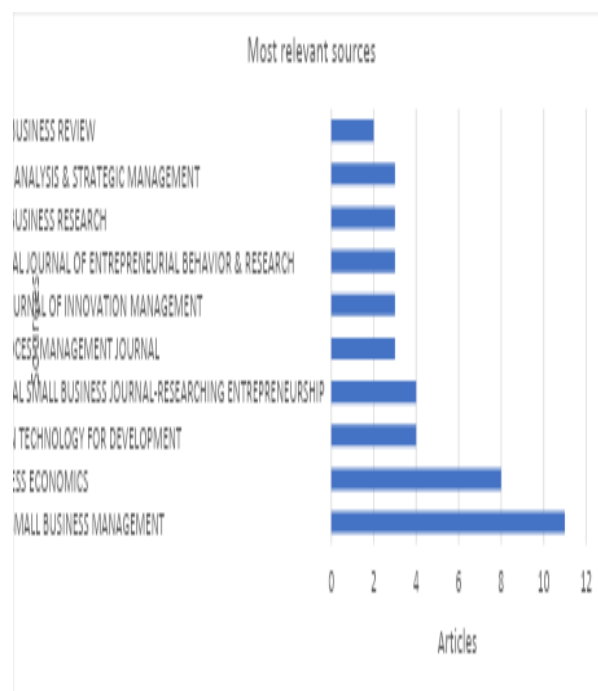


Figure 12. Most Relevant Sources

(Source: Author's computation using Biblioshiny)

Figure 12 shows the keyword co-occurrence network for digital adoption in SMEs. Nodes represent keywords; node size reflects frequency; connecting lines indicate co-occurrence; colors represent thematic clusters. Several clusters center on keywords such as technology adoption, SMEs, information technology, and innovation. Multiple connections among nodes indicate these terms frequently appear together. Overall, the visualization highlights the central role of technology adoption and SMEs, connected to recurring terms like information technology, innovation, and related concepts.

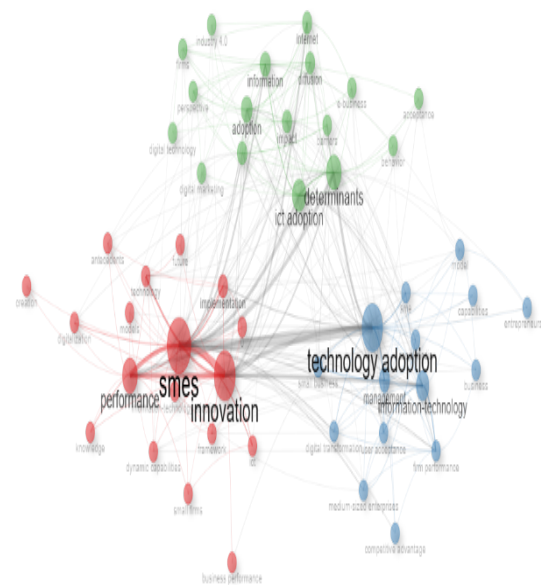


Figure 13. Co-Occurrence Network

(Source: Author's computation using Biblioshiny)

Figure 13's thematic map shows the central cluster (technology adoption, SMEs, innovation) focuses on how digital technologies support innovation and performance in small businesses. Closely connected themes (ICT adoption determinants) address factors influencing adoption. Peripheral themes (implementation, technology diffusion) are less developed, suggesting future research directions. Overall, research concentrates on adoption processes, innovation outcomes, and adoption determinants, while implementation strategies and managerial aspects of digital transformation remain underexplored.

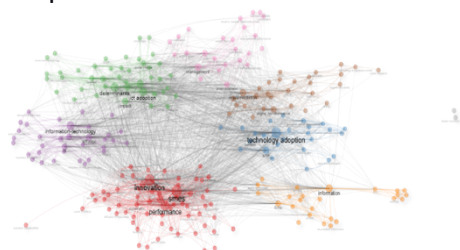


Figure 14. Thematic map

(Source: Author's computation using Biblioshiny)

Figure 14, illustrates the annual distribution of countries production of publications related to digital adoption and digital transformation in SMEs from 2010 to 2025. Among the countries, Italy and the United States demonstrate the most significant growth in recent years, while the United Kingdom shows consistent contribution throughout the period. China and Australia also display gradual increases in publication activity. Overall pattern indicates a growing global research output overtime, with a noticeable acceleration after 2017 and particularly in the post-2020 period.

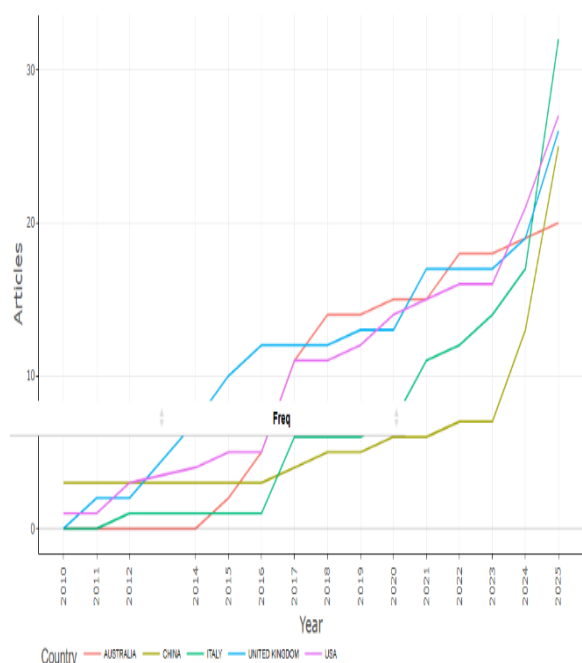


Figure 15. Countries Production Overtime

(Source: Author's computation using Biblioshiny)

Figure 15 shows publication timelines of active authors on SME digital adoption. Horizontal lines represent publishing periods; points indicate publication years; point size reflects contribution or influence. Some authors contributed occasionally, while others show recent concentrated activity. Holl A. and Rama R. display larger recent nodes, indicating higher recent impact. Overall, the figure highlights gradual

scholarly participation and evolving author contributions in this field.

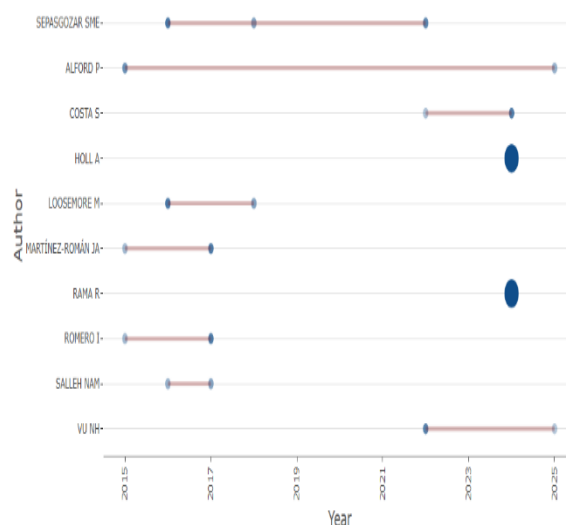


Figure 16. Authors Production Over Time

(Source: Author's computation using Biblioshiny)

Figure 16 presents the distribution of publications on digital adoption in SMEs by country. Italy leads with 32 publications, followed by the United Kingdom (27), Australia (26), China (25), and India (20). Vietnam, Portugal, Saudi Arabia, and Finland show moderate output, while Norway, Bangladesh, Ethiopia, Oman, and Sweden contribute fewer publications. Overall, the distribution highlights research concentration in a few leading countries while indicating growing global engagement in this field.

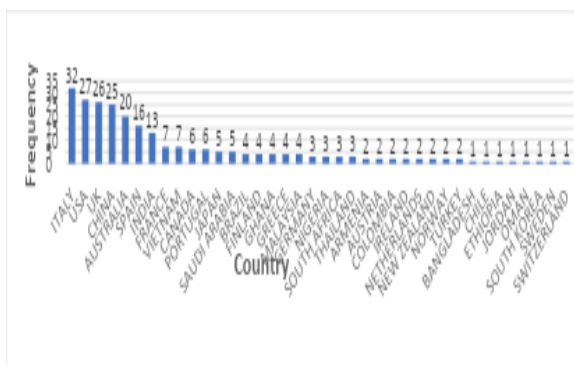


Figure 17. Countries' scientific production

(Source: Author's computation using Biblioshiny)

As shown in figure 17. The study by Bai (2020) published in *International Journal of Production Economics* is the most influential document with 802 citations, significantly exceeding other publications. Other highly cited works include Giotopoulos (2017) in *Journal of Business Research* with 195 citations, Ahmad (2019) in *International Journal of Entrepreneurial Behavior & Research* with 160 citations, and Ifinedo (2011) in *Internet Research* with 157 citations. Additional notable contributions include studies by Kumar (2015), Cimini (2021), Nguyen (2015), Ricci (2021), Audretsch (2021), and Jones (2014). In sum, the figure highlights the key foundational articles that have significantly shaped scholarly discourse on digital and technology adoption in SMEs.

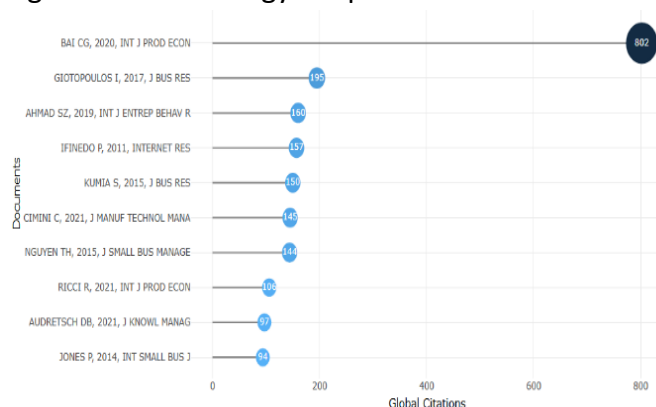


Figure 18. most cited references
(Source: Author's computation using Biblioshiny)

Figure 18 presents a word cloud illustrating the most frequently occurring keywords in the literature on digital adoption in small and medium-sized enterprises. The size of each word reflects its relative frequency within the analyzed dataset. Prominent terms such as *technology adoption*, *SMEs*, *innovation*, *determinants*, *information technology*, and *performance* appear most frequently, indicating their central presence in the analyzed publications. Other recurring keywords including *ICT adoption*, *digital transformation*, *user acceptance*, *internet*, *management*, and *implementation* also appear in the dataset, reflecting commonly discussed topics within the literature. Overall, the word cloud provides an

overview of the dominant keywords used in studies related to digital adoption and technological development in SMEs.



Figure 19. Word Clouds
(Source: Author's computation using Biblioshiny)

5. CONCLUSION AND IMPLICATIONS

This study provides bibliometric approach overview on digital adoption in micro and small enterprises based on the publications indexed in the web of science. The result demonstrates that scholarly interest in the field has expanded notably in recent years, reflecting the growing recognition of digital technologies strategic relevance for small business. Moreover, the analysis identifies a set of influential authors, journals, and highly cited works that have shaped the evolution of this research domain, while collaboration networks reveal an increasingly interconnected contribution of scholars to the development of knowledge in this area.

From the thematic pattern the study indicates that existing literature mainly focus on technology adoption models, innovation, and determinants influencing the adoption of digital tools among small business. whereas, limited attention has been given to the process through which digital technologies are effectively implemented and integrated into every business practice. The findings highlight Important future opportunities particularly in developing economies concerning the investigation of managerial

capabilities, organizational readiness and context related challenges of micro and small enterprises.

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