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Technology Adoption in SMEs: Unraveling Bibliometric Patterns and Public Policy Influences

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ABSTRACT

The rising dependence on digital technologies has made technology adoption a strategic requirement for SMEs aiming to enhance competitiveness and sustainability. However, adoption remains uneven, especially in developing economies where structural, behavioral, and policy factors shape digital transformation. This study analyzes bibliometric patterns and public policy influences in SME technology adoption research by examining Scopus-indexed publications (2010–2024) using VosViewer for keyword co-occurrence and co-authorship mapping. The results show that the literature centers on interconnected clusters, including technology adoption models, policy interventions, digital transformation, Industry 4.0, and data governance. Findings highlight the crucial role of public policy in supporting institutional readiness, infrastructure, and capacity building, while behavioral and organizational elements, such as managerial attitudes, perceived risks, and digital literacy, also affect adoption outcomes. Bibliometric trends reveal a shift from basic ICT tools to advanced digital ecosystems involving automation, AI, and cybersecurity. This mapping clarifies how policy and organizational dynamics jointly shape SME technology adoption and informs future research and policymaking.

Keywords: *Technology Adoption, SMEs, Public Policy, Digital Transformation, Industy 4.0*

How to Cite:

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INTRODUCTION

Technology adoption within small and medium-sized enterprises (SMEs) has become a critical factor shaping global competitiveness, organisational resilience, and long-term economic sustainability. As digital transformation accelerates worldwide, SMEs are increasingly expected to integrate digital tools, automation technologies, and data-driven systems to improve efficiency, respond to market changes, and participate in global value chains. Yet, despite the growing urgency of digitalisation, the rate of technology adoption among SMEs remains uneven and often slow, especially in emerging economies. These discrepancies highlight a complex interplay of technological readiness, behavioural constraints, organisational capabilities, and policy-driven interventions, which must be understood to reduce the widening digital divide and support inclusive economic development. In Indonesia, SMEs contribute more than 60% of the national GDP and absorb approximately 97% of the workforce (Ministry of Cooperatives and SMEs, 2023), underscoring their crucial role in national economic stability. However, low digital adoption continues to limit competitiveness, innovation potential, and long-term sustainability, particularly among resource-constrained firms.

Recent empirical studies demonstrate that SME technology adoption is shaped not only by access to technological resources but also by the behavioural and psychological factors influencing managerial decision-making. Al-Muwajdhi et al. (2024), employing Behavioural Reasoning Theory, found that attitudes toward technology adoption are influenced by both motivating "reasons for" adoption and inhibiting "reasons against," such as perceived risk, fear of disruption, and lack of expertise. These findings reveal that even when technological benefits are evident, internal resistance and cognitive barriers can prevent SMEs from transitioning into digitally enabled organisations. This behavioural dimension is often overlooked by traditional adoption frameworks, yet it remains one of the most persistent challenges, particularly in smaller firms where managerial beliefs directly shape organisational strategy.

The role of government policy has also emerged as a decisive factor in enabling SME digitalisation, particularly in developing economies. Hermawati et al. (2025), studying agricultural SMEs in Indonesia, concluded that policy interventionssuch as subsidised training, financial incentives, and improved digital infrastructuresignificantly enhance technological readiness and financial performance. Their findings suggest that without structured policy support, many SMEs lack the capacity and confidence to adopt new technologies, making public policy not merely regulatory but transformative. This aligns with broader national initiatives, including Indonesia's digital acceleration programs and regional innovation agendas, which position SMEs as key actors in economic modernisation.

Alongside policy and behavioural considerations, the increasing importance of data security and digital trust has added new layers of complexity to adoption decisions. Hasani et al. (2025) demonstrated that the adoption of privacy-enhancing technologies leads to improved organisational performance, higher consumer trust, and strengthened data governance, particularly as SMEs face rising cybersecurity threats. Their study highlights that in digitally intensive markets, technology adoption is no longer limited to operational efficiency but must also ensure privacy, resilience, and regulatory compliancefactors that are increasingly shaping customer expectations and market legitimacy.

The progression of digital transformation has been further influenced by the rise of Industry 4.0 technologies, which introduce advanced capabilities such as automation, robotics, IoT, and cyber-physical systems. Kim and Park (2024) argued that digital transformation is most beneficial when SMEs adopt Industry 4.0 strategically and in alignment with open innovation practices. Their research indicates that the effectiveness of technology adoption is contingent on collaboration, external partnerships, and

organisational readiness, suggesting that digitalisation is not a uniform process but a strategic evolution. Similarly, Rojas-Berrio et al. (2022) found that manufacturing SMEs in emerging economies face significant structural barriers, including limited technological infrastructure and workforce skills, reinforcing the need for gradual and adaptive adoption pathways rather than rapid transformation without preparation.

Building on these foundations, the dynamics of SME digitalisation must also be understood within broader shifts in global economic restructuring. As supply chains become increasingly data-driven and platform-based, SMEs face rising pressure to integrate into digital ecosystems that prioritise transparency, interoperability, and rapid responsiveness. Without sufficient technological capability, SMEs risk exclusion from regional integration frameworks and emerging digital trade networks, reinforcing the urgency for systematic mapping of global research developments. Meanwhile, the shift from tangible resources to knowledge-based and data-driven capabilities means that technology adoption is now a cumulative process requiring continuous learning and organisational adaptation. Yet evidence shows that SMEs often adopt technology reactively rather than proactively, widening the performance gap between digitally mature firms and those constrained by resource scarcity or risk aversion.

To address these complexities, this study employs a bibliometric approach using VosViewer to map the intellectual structure of SME technology adoption within Scopus-indexed literature from 2010 to 2024. By analysing co-occurrence patterns, co-authorship networks, and thematic clusters, the study identifies five dominant research orientations: technology adoption, SMEs, public policy, digital transformation, and Industry 4.0. Bibliometric insights allow researchers to trace conceptual evolution, highlight emerging gaps, and understand how shifting global priorities influence scholarly discourse. Ultimately, this research seeks to integrate empirical findings with large-scale bibliometric evidence to provide a comprehensive understanding of how SME technology adoption evolves within academic literature and how public policy continues to shape digital transformation trajectories across diverse economic contexts.

METHODS OF RESEARCH

This study adopts a bibliometric research methodology to systematically examine the intellectual structure, thematic evolution, and collaborative networks within the field of technology adoption in small and medium-sized enterprises (SMEs). Bibliometric analysis was selected because it enables researchers to quantitatively synthesize large volumes of scholarly publications while maintaining transparency, replicability, and objectivityqualities that traditional narrative reviews often lack (Donthu et al., 2021). Unlike conventional literature reviews that rely heavily on subjective interpretation, bibliometric methods utilize citation-based indicators and network visualization to identify emerging research fronts, influential contributors, and conceptual interconnections across time. The methodological approach of this study integrates database selection, data extraction, dataset refinement, and visualization through VosViewer, allowing for a multidimensional understanding of how the academic discourse on SME technology adoption has evolved between 2010 and 2024. This design aligns with the overarching aim of the research, which is to provide a comprehensive mapping of scholarly development, particularly in relation to digital transformation, organizational readiness, and the influence of public policy on technological integration.

Data Source and Search Strategy

Scopus was selected as the exclusive data source due to its extensive coverage of peer-reviewed journals, standardized metadata structure, and reliability for bibliometric research purposes (Van Eck & Waltman, 2010). The search strategy was developed based on the thematic boundaries defined in the study's title and conceptual framework. A combination of primary keywordsincluding "technology adoption," "SMEs," "digital transformation," "public policy," and "Industry 4.0" was used alongside Boolean operators to refine relevance and avoid thematic dilution. The search was limited to the period between 2010 and 2024 to capture the transition from foundational ICT adoption studies toward more recent discussions involving automation, artificial intelligence, and policy-driven digital innovation. Only journal articles and conference papers written in English were included, ensuring consistency and academic rigor. Editorial notes, book chapters, and non-scholarly sources were excluded. The final search output, exported in CSV format, corresponds to the dataset used in this study and reflects the structure required for processing through VosViewer. This dataset forms the empirical foundation for analyzing publication trends, keyword interactions, and patterns of author collaboration.

Data Cleaning and Preparation

Following extraction, the dataset underwent a rigorous cleaning and standardization process to ensure accuracy and prevent distortion during analysis. Bibliometric datasets frequently contain inconsistencies such as duplicated entries, incomplete metadata, and lexical variations in author names or keyword terminology, all of which can fragment network visualization and weaken interpretive validity (Aria & Cuccurullo, 2017). Therefore, each document was manually reviewed to confirm thematic alignment with SME technology adoption. Records that focused solely on large corporations, unrelated technological domains, or non-organizational contexts were removed. Standardization procedures were applied to harmonize variations such as "SMEs," "SME," and "small and medium-sized enterprises," as well as synonymous technological terms. Author names were verified to avoid splitting identical contributors due to spelling differences. Institutional affiliations and country identifiers were corrected where necessary to ensure accurate representation in co-authorship networks. After refinement, the cleaned dataset was saved in a VosViewer-compatible CSV format, ensuring that subsequent visualizations accurately reflected the structural patterns present in the literature without artificial fragmentation.

Analytical Tool and Procedures

The bibliometric analysis was conducted using VosViewer version [insert version used], a software specifically designed for constructing, clustering, and visualizing scientific networks. VosViewer was chosen because of its capacity to handle large datasets, generate spatially interpretable network maps, and apply clustering algorithms that are widely recognized within bibliometric scholarship (Zupic & Čater, 2015). The analytical procedures in this study involved two primary techniques: co-occurrence analysis and co-authorship analysis. Co-occurrence analysis was utilized to identify conceptual connections among frequently appearing keywords across publications, thereby revealing dominant research themes and their evolution over time. Co-authorship analysis, meanwhile, was employed to examine the collaborative structure among authors, institutions, and countries contributing to the field. Threshold settings were applied to filter out low-frequency items to prevent visual congestion while preserving analytical depth. The combination of these procedures enables the study to capture both the intellectual composition of the field and the social dynamics that underpin knowledge production.

Co-Occurrence Analysis

The co-occurrence analysis focused on examining how author-provided keywords appeared together within the dataset, providing insight into the thematic architecture of the research field. Using VosViewer's full counting method, only keywords meeting the minimum frequency threshold were included in the generated network. The resulting visualization revealed several distinct thematic clusters. Early-period publications were associated with foundational concepts such as ICT adoption, perceived usefulness, and organizational readiness, reflecting the influence of theoretical models like the Technology Acceptance Model. In contrast, more recent clusters demonstrated a shift toward advanced topics including digital transformation, Industry 4.0 capability, cybersecurity, e-commerce integration, and policy-driven innovation support. These patterns align with broader scholarly observations that SMEs are transitioning from basic digital tools toward more complex technological ecosystems. The co-occurrence findings also support the argument that technology adoption research has expanded beyond internal organizational determinants to incorporate external enablers such as institutional policy, national digital strategies, and ecosystem readiness, indicating a widening of theoretical and practical relevance within the literature.

Co-Authorship Analysis

To complement the conceptual mapping, co-authorship analysis was conducted to examine the collaborative landscape shaping research on SME technology adoption. VosViewer's fractional counting approach was applied to ensure balanced representation of author contributions, particularly in publications involving multiple co-authors. The analysis revealed the presence of several core research clusters, indicating that the field is influenced by a combination of established scholars and emerging researchers contributing to rapidly expanding sub-topics such as digital capability development and policy intervention frameworks. International collaboration patterns were evident, with increasing participation from authors based in Southeast Asia, the Middle East, and Latin America, reflecting the growing global relevance of SME digitalization challenges. The network structure suggests that the field is moving away from isolated, country-specific studies toward a more interconnected research environment characterized by cross-institutional and cross-regional partnerships. This trend reinforces the observation that technological transformation in SMEs is not merely a localized organizational concern but a shared global priority influenced by broader economic and policy dynamics.

RESULT AND DISCUSSION

This section presents the findings from the bibliometric analysis conducted using VosViewer software. The analysis encompasses two primary visualizations: co-authorship networks, which map collaborative relationships among authors, and co-occurrence of keywords, which delineates thematic clusters and interconnections within the literature. The results are organized into three key topical areas based on the dominant themes emerging from the dataset: (a) public policy, (b) cultural issue, and (c) technology adoption. These topics reflect the interdisciplinary nature of the research, drawing from public governance, socio-cultural contexts (e.g., regional and developmental disparities), and digital transformation processes.

Public Policy Topics

The co-authorship network in the public policy domain reveals a tightly interconnected group of researchers, with core authors such as Köhler, Bühler, Nübel, Jelinek, Horvath, and Hollenbach forming the central nodes. These authors are linked through dense edges, indicating frequent collaborative publications and a stable scholarly network. The absence of isolated subgroups suggests that research in this area is predominantly collective, often within shared institutional or project-based frameworks. This structure implies a cohesive intellectual community where contributions are mutually reinforcing, fostering consistency in research focus and methodological approaches.

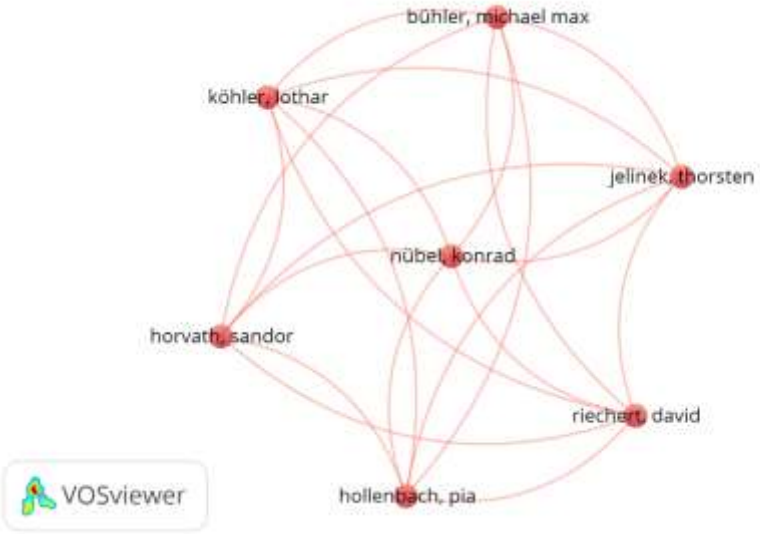

Figure 1. Co-Authorship Analysis of Public Policy Topics

The co-occurrence keyword analysis identifies four primary clusters, underscoring the multidimensional scope of public policy research:

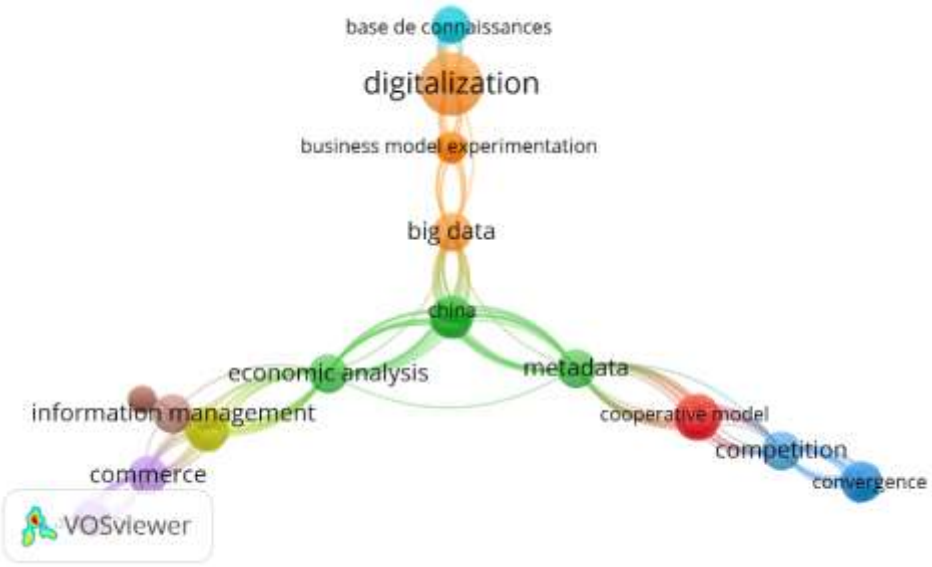

Figure 2. Co-Occurrence Analysis of Public Policy Topics
(Source: VosViewer, 2025)

Table 1. VosViewer Analysis of Public Policy Topics

Cluster Red	Cluster Green	Cluster Blue	Cluster Yellow
Human Development & Social Policy. This cluster includes keywords such as "human development," "education," and "social welfare." It highlights research emphasizing societal well-being, policy impacts on quality of life, and education's role in human capital building.	Governance, Policy Implementation & Institutional Analysis. As the central cluster, it features terms like "public policy," "governance," and "policy implementation." This reflects a core focus on policy formulation, government structures, and implementation efficacy, serving as a bridge to other themes.	Environmental & Sustainable Policy. Keywords such as "environmental policy," "sustainability," and "climate adaptation" dominate, indicating growing attention to environmental impacts, sustainability strategies, and climate resilience in policy frameworks.	Digital Policy & Innovation in Public Service. This includes "digital governance," "e-government," and "public service innovation," pointing to emerging trends in technology-driven administration, data utilization, and innovative service delivery.

(Source: VosViewer, 2025)

Overall, the keyword map demonstrates strong interconnections, with "governance" as a pivotal node linking social, environmental, and digital dimensions of public policy.

Cultural Issue Topics

The co-authorship visualization for cultural issues shows a highly interconnected network without fragmented clusters, featuring central authors like Nübel, Konrad, Bühler, and Michael Max. These nodes

act as intellectual connectors, suggesting intensive collaboration within a unified research group, possibly tied to shared cultural or regional contexts (e.g., studies involving China or Europe). The egalitarian distribution of connections indicates balanced contributions, reflecting a collaborative model that transcends individual dominance and promotes cross-cultural knowledge exchange.

Figure 3. Co-Authorship Analysis of Cultural Issue Topics
(Source: VosViewer, 2025)

In the co-occurrence keyword analysis, cultural issues emerge through clusters that incorporate geo-cultural contexts, economic disparities, and societal dynamics:

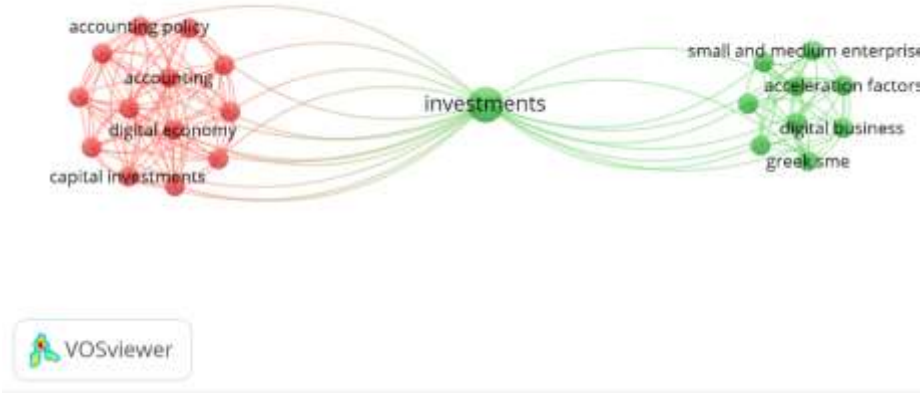

Figure 4. Co-Occurrence Analysis of Cultural Issue Topics
(Source: VosViewer, 2025)

Table 2. VosViewer Analysis of Cultural Issue Topics
(Source: VosViewer, 2025)

Cluster Green-Yellow	Cluster Blue-Red	Cluster Purple-Yellow-Brown:
Economic Analysis and Information Management. Keywords include "economic analysis," "information management," "metadata," and "China." This cluster reveals research on cultural-economic intersections, such as how metadata and economic frameworks are applied in culturally specific settings like China, emphasizing information handling in diverse socio-cultural environments.	Competition, Convergence, and Cooperative Models. Terms like "competition," "convergence," and "cooperative model" highlight cultural shifts in business and policy, including how digital convergence fosters cooperative models across cultural boundaries, often in competitive global landscapes.	Commerce, Information Management, and Knowledge Base. Keywords such as "commerce," "information management," and "knowledge base" (including "base de connaissances") underscore cultural aspects of knowledge dissemination, digital commerce transformation, and information as a cultural asset, particularly in multicultural or developing contexts.

A bridging element is evident in keywords like "China" and "convergence," which connect cultural specificity (e.g., regional studies) with broader global themes, illustrating how cultural issues influence and are influenced by economic and informational dynamics in research.

Technology Adoption Topics

The co-authorship network in technology adoption displays a densely connected structure, with central authors such as Poernomo, Raden Tri, Iskandar, Joni, and Setiawan Agus serving as bridging figures. The lack of separate subclusters points to intensive, integrated collaboration, likely within large teams or shared research environments. This pattern suggests a collective, horizontal approach to knowledge production, enhancing interdisciplinary potential in technology-related studies.

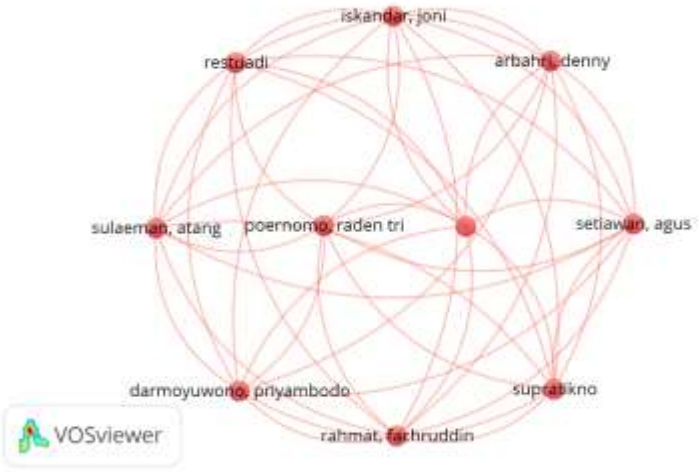

Figure 5. Co-Authorship Analysis of Technology Adoption Topics
(Source: VosViewer, 2025)

The co-occurrence keyword map reveals five interconnected clusters, centered on technology adoption in contexts like MSMEs, blockchain, and digital platforms:

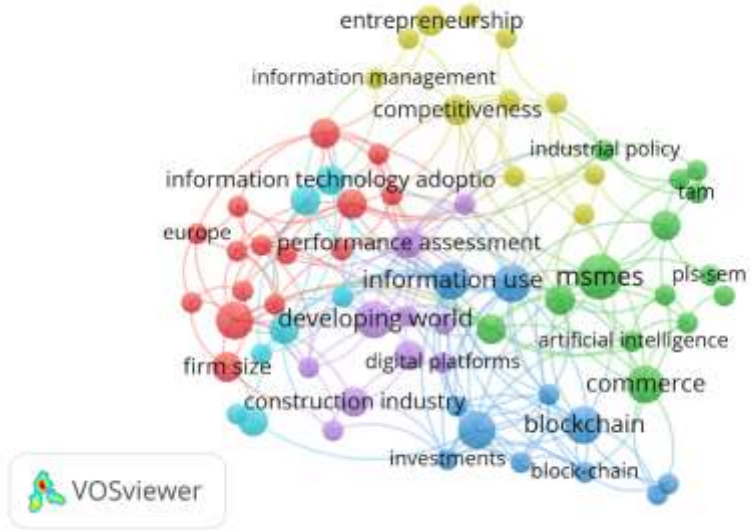

Figure 6. Co-Occurrence Analysis of Technology Adoption Topics
(Source: VosViewer, 2025)

Table 3. VosViewer Analysis of Technology Adoption Topics
(Source: VosViewer, 2025)

Cluster Green	Cluster Blue	Cluster Red	Cluster Purple	Cluster Yellow
MSMEs, Artificial Intelligence, and Digital Adoption Models.. Dominant keywords include "MSMEs," "artificial intelligence," "commerce," "PLS-SEM," and "TAM" (Technology Acceptance Model). This cluster focuses on digital technology uptake in small enterprises, analytical models for adoption, and AI integration.	Blockchain and Digital Platforms. Terms like "blockchain," "digital platforms," "investments," and "commerce" emphasize emerging technologies for transaction security, investment in digital infrastructure, and platform-based commerce.	Technology, Performance, and European Contexts. Keywords such as "information technology adoption," "performance assessment," "Europe," and "firm size" highlight factors influencing IT adoption, firm performance evaluation, and regional (European) applications.	Developing World and Construction Industry. Including "developing world," "construction industry," and "digital platforms," this cluster addresses adoption challenges in emerging economies and specific sectors like construction.	Entrepreneurship, Competitiveness, and Industrial Policy. Keywords like "entrepreneurship, " "competitiveness, " "industrial policy," and "information management" link technology adoption to policy strategies, competitiveness enhancement, and entrepreneurial innovation.

Central nodes such as "MSMEs," "information technology adoption," and "blockchain" integrate these clusters, demonstrating the multidisciplinary nature of technology adoption research, blending technology, management, economics, and policy perspectives.

Discussion

The bibliometric analysis provides a comprehensive understanding of how research on technology adoption in SMEs is structured across three interconnected thematic pillars: public policy, cultural issues, and technology adoption. These themes reflect the multidimensional nature of digital transformation, demonstrating that technological integration within SMEs is not merely a technical process but one that is shaped by institutional governance, socio-cultural contexts, and organizational capabilities. The findings highlight that scholarly discussions surrounding SME digitalization are anchored in interdisciplinary linkages, where governance structures, cultural conditions, and technological frameworks mutually reinforce one another. Interpreting these themes collectively enables a more holistic understanding of how digital transformation unfolds, particularly in environments where policy alignment, cultural adaptability, and capability-building remain uneven.

The findings indicate that public policy research forms a cohesive intellectual structure, reflected in tightly interconnected co-authorship networks and thematically aligned keyword clusters. This coherence suggests a mature research domain where scholars frequently collaborate on governance, social welfare, sustainability, and digital policy topics. However, despite this strong academic connectivity, the literature reviewed in the source document reveals persistent challenges in real-world policy implementation. SMEs continue to experience structural barriers arising from fragmented and poorly aligned digital strategies, which limits their ability to integrate new technologies effectively. This is highlighted by the identification of “lack of coordinated digital transformation policies” as a significant factor that heightens the technology burden faced by SMEs. The presence of such inconsistencies underscores the gap between scholarly insights and governmental execution. Furthermore, the literature stresses that effective public policy must be complemented by capacity-building initiatives, as “employee and manager digital literacy” is essential to overcoming internal adoption barriers and strengthening organizational readiness for technological change. These findings collectively imply that policy frameworks must evolve toward integrated, multi-level governance approaches that align institutional support, regulatory mechanisms, and human capital development to foster more enabling conditions for SME digital transformation.

The cultural dimension emerges as a critical factor shaping how SMEs perceive, adopt, and utilize digital technologies. The bibliometric patterns reveal that discussions about culture intersect with geopolitical contexts, economic structures, and knowledge processes, as reflected in clusters involving information management, economic analysis, convergence dynamics, and cross-cultural commerce. These thematic intersections indicate that cultural issues do not operate in isolation; rather, they underpin broader organizational and societal behaviors that influence technological integration. The underlying literature further substantiates this interpretation by emphasizing that “cultural barriers can hinder digital transformation,” pointing to the ways in which conservative norms, resistance to change, hierarchical communication patterns, and limited cross-cultural understanding can inhibit the uptake of digital tools within organizations. These cultural constraints are described as “key challenges” that continue to obstruct digital adoption in many contexts, regardless of technological availability or policy support. The strong presence of geo-cultural keywords such as “China,” “convergence,” and “commerce” reinforces that cultural dynamics shape information behavior, collaboration, and strategic decision-making across diverse

regional settings. Consequently, cultural adaptability becomes an indispensable component of digital transformation, requiring organizations to cultivate openness, flexibility, and cross-cultural management competencies to derive meaningful benefits from technological innovations.

The technology adoption theme presents the most diverse and multidisciplinary structure within the bibliometric results, demonstrating how research on digital transformation has expanded beyond traditional acceptance models toward complex ecosystem-based perspectives. Keyword clusters associated with MSMEs, artificial intelligence, blockchain systems, digital platforms, performance assessment, and sector-specific innovation illustrate that technology adoption is influenced by a combination of organizational, economic, and institutional factors. This thematic diversity mirrors the challenges articulated in the reference literature, where SMEs commonly struggle with high implementation costs, insufficient expertise, cybersecurity vulnerabilities, and overall technological burden. These internal limitations interact with external pressures, such as evolving regulatory demands and competitive market conditions, thereby forming a complex landscape in which adoption decisions must be made. The documented emphasis on capacity-buildingparticularly digital literacy, managerial competence, and structured trainingreinforces that successful technology adoption extends beyond tool acquisition toward sustained development of organizational capabilities. As such, digital transformation must be understood as a continuous process shaped by strategic alignment, knowledge development, and adaptive decision-making, rather than a mere technological upgrade.

Synthesizing these insights reveals that public policy, cultural issues, and technology adoption form an interconnected system that shapes digital transformation outcomes in SMEs. Public policy establishes the structural environment through regulatory frameworks, institutional support, and coordinated digital strategies. Cultural dynamics influence how organizations internalize change, respond to technological shifts, and engage with cross-cultural knowledge flows. Technology adoption, in turn, reflects the operational manifestation of these broader forces, expressing the extent to which SMEs can leverage digital capabilities to enhance competitiveness and performance. The alignment of these three dimensions is essential to achieving sustainable digital transformation. Fragmented policies may undermine technological progress, culturally resistant organizations may hinder adoption regardless of available tools, and weak technological capabilities may limit the impact of even the most supportive governance structures. Therefore, a comprehensive understanding of SME digital transformation requires an integrative perspective that accounts for the multi-dimensional interplay between governance, socio-cultural environments, and technological readiness. This approach not only reflects the complexity observed in the bibliometric patterns but also aligns with broader theoretical developments in digital transformation and innovation systems.

CONCLUSION

This study demonstrates that technology adoption in SMEs is a multidimensional process shaped by three major domains: public policy, cultural issues, and organizational technological capabilities. Through a bibliometric analysis using VosViewer on Scopus-indexed publications from 2010 to 2024, the findings reveal that research on SME digitalization has evolved into a multidisciplinary field that increasingly highlights the role of broader ecosystems in driving digital transformation.

First, public policy plays a central role in accelerating SME digital readiness by providing infrastructure, supportive regulations, and capacity-building initiatives. However, challenges persist due to

fragmented policy implementation, limited digital literacy, and uneven institutional alignment. These findings underscore the need for more coordinated, inclusive, and capability-oriented policy designs to enhance the effectiveness of digital transformation strategies for SMEs.

Second, cultural issues are shown to be critical determinants of how SMEs perceive, adopt, and utilize digital technologies. Conservative mindsets, resistance to change, and hierarchical communication structures often hinder technology uptake. The bibliometric analysis further demonstrates that cultural and geopolitical contexts shape information behavior, collaboration patterns, and strategic decision-making. Thus, successful digital transformation requires cultural adaptation that fosters openness, innovation, and cross-cultural organizational learning.

Third, technology adoption within SMEs is shifting from basic ICT tools toward more advanced systems such as artificial intelligence, blockchain, digital platforms, and Industry 4.0 technologies. Despite these advancements, SMEs continue to face significant barriers, including high implementation costs, limited technical skills, and cybersecurity risks. Strengthening technological capabilities and enhancing digital literacy among both managers and employees remain essential for maximizing the benefits of digital transformation.

Overall, this study concludes that the success of SME digital transformation depends on the alignment between effective public policy, adaptive organizational culture, and robust internal technological capabilities. The bibliometric mapping contributes to a deeper understanding of the intellectual structure of this research field and provides a foundation for designing more integrated strategies and future scholarly investigations to support sustainable SME digitalization.

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