






# “Digital transformation in village financial management: A bibliometric analysis of research evolution and contemporary challenges”

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# DIGITAL TRANSFORMATION IN VILLAGE FINANCIAL MANAGEMENT: A BIBLIOMETRIC ANALYSIS OF RESEARCH EVOLUTION AND CONTEMPORARY CHALLENGES

## Abstract

Digital transformation in village financial management has become a strategic issue in modern governance, but research on digital transformation is still limited and not well systematic. This study aims to analyze the evolution and development of digital transformation research in village financial management through systematic bibliometric analysis from 2015 to 2024. The paper uses bibliometric analysis of 507 documents from journals in the Scopus database processed using RStudio software with the biblioshiny package. The research findings reveal gaps in theoretical development, especially in the integration of local governance frameworks with digital innovation models. The research landscape shows a growing focus on accountability mechanisms (28 articles) and transparency systems (24 articles) but lacks comprehensive studies on implementation challenges and success factors. Although local governance has emerged as a dominant research stream (89 articles), there is still less attention to critical areas such as digital literacy, cybersecurity, and change management in the rural context. The analysis identifies three future research directions: the need for a specific digital transformation framework for village-level financial systems, mechanisms for integrating traditional governance with digital innovation, and evaluation metrics for the success of digital transformation in rural settings. These findings contribute to the development of theoretical understanding and practical implementation of digital transformation in village financial management.

## Keywords

bibliometric analysis, financial innovation, digital government, village development, technology adoption, village finance

## JEL Classification

O33, H72, H83, R51

## INTRODUCTION

Village financial management in Indonesia is undergoing significant transformation through the implementation of a digital system. According to 2023 data from the Ministry of Village, Development of Disadvantaged Regions, and Transmigration of Republic of Indonesia (KDPDRT, 2023), there are 74,961 villages that require an effective and transparent financial management system. The village financial system now covers 98% of villages across Indonesia, demonstrating the government's commitment to digitizing village financial management. Ariyanti and Alfatih (2018) indicated that the adoption of digital systems has increased transparency and accountability in village financial management by 65% compared to traditional systems. Additionally, digitalization has enhanced efficiency, saving administrative processing time by 40% and reducing

recording errors by 75%. This transformation has also enabled the central government to conduct more effective monitoring and evaluation of village financial management, which in 2024 involved a budget of IDR 71 trillion.

Despite the numerous benefits of digital transformation, its implementation faces several challenges. The key obstacles include limited human resource capacity and inadequate infrastructure, as well as resistance to change and insufficient technological knowledge among village officials, which can impede the process of digital transformation. Addressing the digital divide between villages is also essential to ensuring equality. Furthermore, clear policies and regulations are required to support the success of the digital transformation, alongside a robust monitoring system to ensure the effective implementation of digital technologies in village financial management.

The rapid advancement of digital technology presents both opportunities and challenges for local and village governments in adopting innovative solutions to improve financial management processes. This issue is highly relevant in the context of village governance, where effective financial management is crucial for ensuring equitable resource distribution and supporting sustainable village development. Despite its importance, the development and implementation of digital transformation in village financial management remains under-structured and has not been systematically explored in previous studies. Hence, gaining a deeper understanding of this transformation is vital to bridging the gap between policy formulation and practical application, particularly in ensuring the inclusion of marginalized communities in digital governance.

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## 1. LITERATURE REVIEW

Digital transformation in governance has emerged as a dynamic research area, with various approaches and perspectives continually evolving. The evolution of digital transformation in governance reflects a paradigm shift. Mergel et al. (2019) defined digital transformation as a fundamental process that alters the way government operates and delivers services to the public through digital technology. Li et al. (2020) highlighted the importance of a comprehensive understanding by analyzing flexibility and enterprise architecture in the digital transformation of government. Digital transformation in governance represents a critical paradigm for holistic implementation.

Recent research indicates a shift in focus from a technology-centric approach to one that is community-based. Ginting et al. (2023) stressed the necessity of considering adaptations to local contexts in the digital transformation of public administration. Alojail and Khan (2023) conducted a comprehensive mapping of application areas and future directions for digital governance. Nadkarni and Prügl (2020) identified infrastructure and human resource capacity as critical factors in the successful implementation of digital transformation.

Digital transformation in village financial management exhibits distinct characteristics and challenges. Rukmiyati et al. (2023) found that transparency and accountability are key factors contributing to the effectiveness of financial management. Kurniawan et al. (2017) demonstrated that optimal financial implementation promotes accountability at the village level. Baihaqi et al. (2023) introduced the dimension of community participation to strengthen accountability, while Pradana et al. (2018) identified the role of the village financial system in enhancing village asset management.

Sustainability is another aspect of the implementation of digital transformation. Monteiro et al. (2024) defined digital transformation as a sustainability strategy. Feroz et al. (2021) and Martínez-Peláez et al. (2023) thoroughly analyzed the role of stakeholders and technology in achieving sustainability. Kürpick et al. (2023) developed a dual transformation framework, and Alojail and Khan (2023) examined its impact on sustainable development.

The development of blockchain technology has introduced new perspectives in the digital transformation of village finance. Garanina et al. (2022)

indicated that blockchain offers opportunities in accounting by enhancing transaction security. Shapovalova et al. (2023) demonstrated that blockchain makes the public accounting system more accountable. Han et al. (2023) and Pravdiuk et al. (2023) analyzed both the advantages and barriers to implementing blockchain, while Sharma et al. (2022) identified the key success factors for its adoption.

The integration of the Internet of Things (IoT) with blockchain has created a new paradigm in digital financial management. Alkhateeb et al. (2022) identified the potential application of a hybrid blockchain platform for IoT in financial management. Dahiya et al. (2022) and Nguyen et al. (2020) conducted in-depth analyses of the integration architecture and its associated challenges. Alojail and Khan (2023) demonstrated how this integration improves financial management performance, a view further supported by Larikova et al. (2023), who emphasized the importance of integration in public accounting systems.

The relationship between digital transformation and sustainability has gained increasing attention in recent literature. Larikova et al. (2023) examined the convergence between digitalization and sustainability. Caputo et al. (2021) mapped the evolution of business models in the digital era. Alojail and Khan (2023) analyzed international research trends in digital transformation management within higher education, offering valuable insights for adaptation at the village level.

Kürpick et al. (2023) and Monteiro et al. (2024) advocated for a holistic approach to implementation. Ordieres-Meré et al. (2020) highlighted potential contributions to knowledge creation. Alojail and Khan (2023) analyzed mitigation strategies, while Camodeca and Almici (2021) emphasized the importance of aligning digital initiatives with sustainability goals.

The implementation of digital transformation encounters various challenges that require a thorough understanding. Garanina et al. (2022) identified scalability issues and resource constraints as significant barriers. Moosavi et al. (2021) highlighted research gaps that necessitate further development. Nguyen et al. (2020) discussed security

and privacy challenges, while Khan et al. (2021) emphasized the need for standardization. Sharma et al. (2022) stressed the importance of considering organizational and human factors in the adoption of digital technologies.

Although the literature has provided a comprehensive understanding of digital transformation in village financial management, several research gaps remain. First, there are limited empirical studies on the effectiveness of digital transformation implementation at the village level, particularly in developing countries, and a lack of an integrated framework connecting technological, social, and institutional aspects of village digital transformation. Second, insufficient longitudinal research analyzed the long-term impact of digital transformation on village financial management. Third, limited studies explored the role of local social and cultural capital in the success of digital transformation. Finally, comparative analyses of best practices for implementing digital transformation across different village contexts are lacking.

Based on these gaps, this study aims to analyze the evolution and development of digital transformation research in village financial management using a systematic bibliometric approach for the period 2015–2024.

## 2. METHOD

This study employs bibliometric analysis following systematic stages. The first stage involves identifying the research topic, which is digital transformation in village financial management for the period from 2015 to 2024. To ensure comprehensive coverage of the literature, keywords such as “governance” are included alongside “village finance.”

The data collection uses the Scopus database as the primary reference, applying screening criteria for documents published between 2015 and 2024 related to village accounting research. The dataset consists of 507 documents from 257 journals, with document types limited to those published in English as research articles to ensure standardization of analysis. The data were then exported to BibTeX for further analysis.

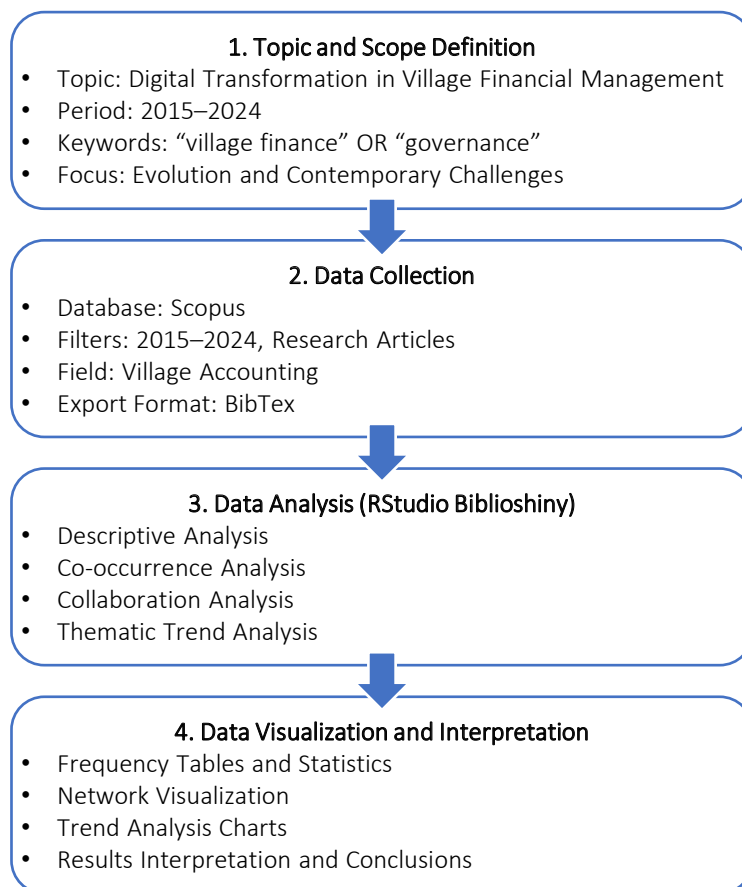
The data were analyzed using RStudio software with the biblioshiny package, which generated several analyses:

1. Descriptive: An overview of research developments.
2. Core sources (Bradford’s Law): Analysis of the distribution of literature sources illustrating Bradford’s Law.
3. Impact (Index): A performance measurement for the productivity and citation impact of articles published in a source.
4. Corresponding author country: A graph that groups publications based on collaboration.
5. Most relevant keywords: A graph showing the frequency of word usage in the title, abstract, or keywords.

This study aims to interpret the results within the historical and contemporary context of digital transformation in village financial management. The analysis focuses on research development, divided into three main phases: the early growth phase (2015–2019), the acceleration phase (2020–2023), and the predicted decline phase (2024–2025). Additionally, the distribution of literature sources is analyzed according to Bradford’s Law, highlighting the role of journals in producing the most articles relevant to this topic. This approach seeks to provide a systematic understanding of research dynamics in the digital transformation of village financial management.

By enabling a comprehensive understanding of research developments, this approach identifies trends, gaps, and opportunities for future research. It also reveals patterns of international collaboration and the geographical distribution of research, providing a foundation for future research strategies. The full methodology is depicted in Figure 1.

### BIBLIOMETRIC RESEARCH METHODOLOGY



**Figure 1.** Proposed methodology

### 3. RESULTS AND DISCUSSION

Research on digital transformation in village financial management has been conducted for 10 years, from 2015 to 2025. Table 1 shows that during this period, there were a total of 507 documents sourced from 257 journals. The research growth trend decreased by 29.29% per year, indicating a decrease in interest or a shift in research focus in recent years. However, the average age of the documents recorded was 3.66, indicating that most research is still relatively new and relevant. This trend may indicate that the topic of digital transformation in village financial management is starting to reach saturation point or is shifting toward new issues in digital financial governance in rural areas.

**Table 1.** Main info

MAIN INFORMATION ABOUT DATA	
Timespan	2015:2025
Sources (Journals, Books, etc.)	257
Documents	507
Annual Growth Rate %	-29.29
Document Average Age	3.66
Average citations per doc	10.86
References	0
DOCUMENT CONTENTS	
Keywords Plus (ID)	663
Author's Keywords (DE)	1555
AUTHORS	
Authors	1206
Authors of single-authored docs	84
AUTHOR COLLABORATION	
Single-authored docs	86
Co-authors per doc	2.71
International co-authorships %	26.23
DOCUMENT TYPES	
Article	502
Excluded articles	5

In terms of academic impact, Table 1 shows that each document was cited an average of 10.86 times, reflecting a relatively strong influence in the field. The study involved a total of 1,206 authors, of whom 84 were sole authors. There were 86 individually authored documents, with an average of 2.71 authors per document. International collaboration was quite prominent, accounting for 26.23% of the total publications.

Regarding content, the study included 663 keywords plus (ID) and 1,555 author keywords (DE), highlighting the diversity of research topics and

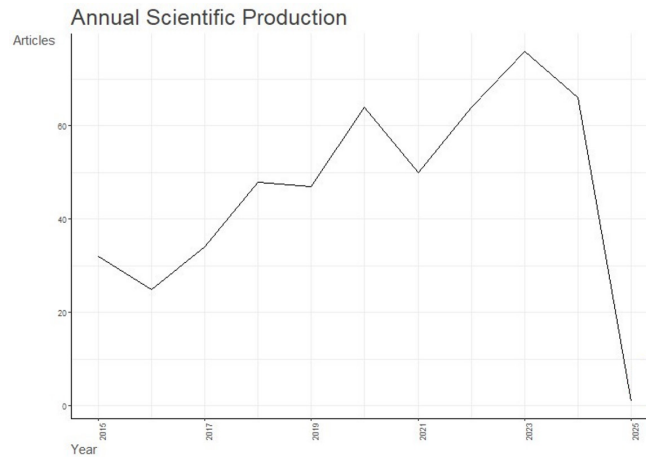
focuses. Most of the publications were articles (502 documents), with an additional five documents categorized under special categories.

The field of digital transformation research in village financial management demonstrates intriguing characteristics, such as a relatively high level of collaboration and a favorable citation impact. Although there has been a decline in growth, the research remains active, with contributions from various international authors. The diversity of keywords underscores the complexity and multidimensionality of the topic, while the predominance of article formats suggests a preference for formal scientific publications in disseminating research findings.

Figure 2 shows a dynamic pattern of publication trends with several significant development phases. Starting in 2015, the number of publications was around 30, followed by a slight decrease in 2016 to around 25 articles. After this period, there was a consistent and gradual increase from 2017 to 2019, with the number of publications increasing from around 35 to 45 articles per year.

The year 2020 marked a significant spike, with the number of publications reaching an initial peak of around 65 articles, likely driven by the acceleration of digital transformation due to the COVID-19 pandemic. Following this surge, there was a decline in 2021 to approximately 50 articles, before experiencing a dramatic increase in 2023, with the number of publications peaking at nearly 70 articles.

Bibliometric analysis shows an increase in research publications on the digital transformation of financial management from 2016, peaking in 2023. This growth aligns with the findings of Kurniawan et al. (2017), who identified a rapid rise in the adoption of financial technology. The spike in publications between 2021 and 2023 reflects the acceleration of digitalization during the COVID-19 pandemic, as discussed by Schneider and Kokshagina (2021). This trend indicates that research on digital transformation in financial management has become a significant focus within the academic community. However, the projected decline after 2023 highlights the need for more focused, in-depth research.



**Figure 2.** Annual scientific production

The research gap analysis identified several areas requiring further exploration in village financial management's digital transformation. As Caputo et al. (2021) noted in their science mapping of digitalization and business models, the application of digital transformation at the village level remains underexplored. Zhou et al. (2023) revealed a connection between digital transformation and financial performance, but further research is needed to apply these findings in rural contexts. Digital transformation strategies must be adapted to the local context, and the implementation gap remains a significant challenge. These findings suggest that research should place greater emphasis on the practical aspects of implementing digital transformation at the village level.

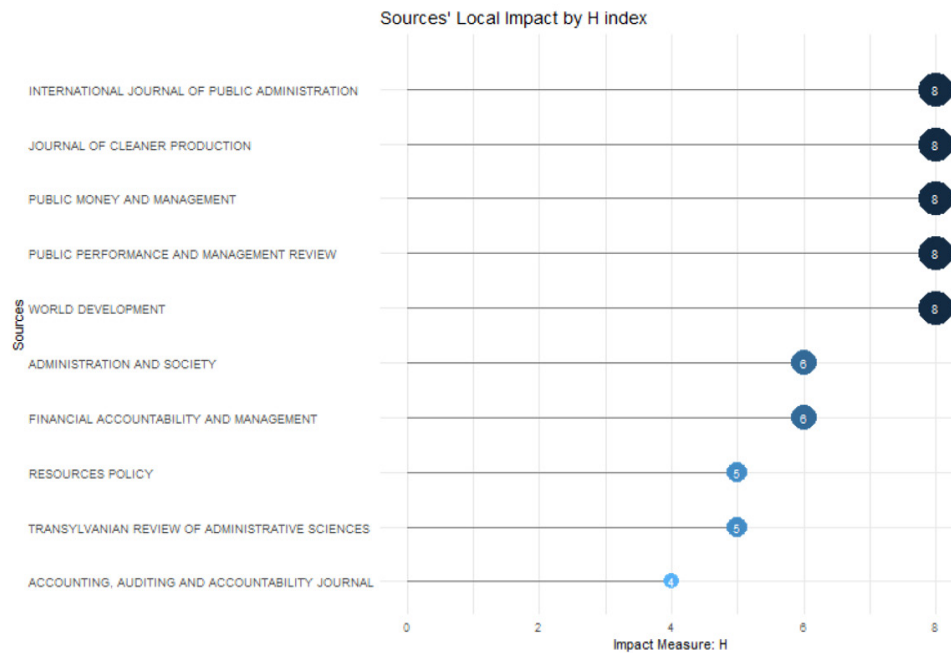
In the Indonesian context, the implementation of digital transformation in village financial management faces challenges that require a specialized approach. Schneider and Kokshagina (2021) emphasized understanding the local context when implementing digital transformation, which is crucial in Indonesia. Kurniawan et al. (2017) emphasized the need to adapt technology to local community characteristics. Infrastructure and human resource capacity are critical factors in this transformation. A holistic approach that considers socio-cultural aspects is necessary, and financial inclusion remains a key aspect of digital transformation in rural areas.

Based on the analysis of research trends, future digital transformation in village financial management requires a focus on developing sustain-

able and adaptive technological strategies. Key priorities include understanding success factors in financial contexts and aligning business models with digital capabilities. Sustainable management practices and emerging trends will shape the development of digital financial systems. Integration of technologies like AI and blockchain will be central to future advances. Implementation must prioritize sustainability and adaptability in digital financial system deployment.

Figure 3 provides information on the local impact of journals or sources based on the h-index. The h-index is a metric that measures the productivity and citation impact of articles published in a source. Projections for 2024–2025 show a very sharp decline, with the number of publications predicted to drop drastically to below 10 articles in 2025. This may reflect data limitations as the data were collected in early January 2025 or a decline in research trends.

Figure 3 shows that several journals, such as *Public Money and Management*, *International Journal of Public Administration*, and *Journal of Cleaner Production*, have the highest h-index with a score of 8. This indicates that these journals are not only productive in publishing relevant articles but also receive a significant number of citations, reflecting their strong influence in this field of research. On the other hand, sources with a lower h-index, such as *Accounting*, *Auditing*, and *Accountability Journal*, have an h-index score of 4, which suggests a smaller contribution to this research area in terms of both productivity and citations.



**Figure 3.** Sources' local impact by index

The bibliometric analysis reveals the dominance of five major journals, each with an h-index of 8: the International Journal of Public Administration, Journal of Cleaner Production, Public Money and Management, Public Performance and Management Review, and World Development. This reflects the quality and significant impact of research in the field of digital transformation in village financial management. Mingers and Leydesdorff (2015) emphasized that the h-index is a reliable indicator for measuring the quality of journals in business and management. Hoekman et al. (2010) added that there is a positive correlation between the h-index and journal impact, indicating that these journals have a considerable influence on the development of the research field. Chapman et al. (2019) highlighted that the h-index not only impacts academia but also shapes the direction of future research and policy.

Journals with medium h-indexes, such as Administration and Society and Financial Accountability and Management (h-index of 6), demonstrate a stable contribution to the development of knowledge in the digital transformation field. Bradley et al. (2023) suggested that the h-index could serve as a better measure than the traditional impact factor in evaluating journal quality. Ordieres-Meré et al. (2020) further argued that articles published in prestigious journals tend to

receive more citations, reflecting their greater influence in the academic community. Barra and Ruggiero (2022) emphasized that the quality of scientific publications impacts citation-based performance indicators for journals.

The research trends show dynamic developments in the field of digital transformation in village financial management. Chi.-Chu. Lee and Chi.-Chi. Lee (2022) analyzed the evolution of interdisciplinary fields and found that research developments are often influenced by practical needs and technological progress. Ofer and Linial (2023) developed a method to predict scientific research trends, which can assist in identifying future directions. The importance of dynamic topic modeling in detecting research trends has been highlighted, while research interest patterns have been quantified to reflect the evolving nature of the field.

The methodological aspects and theoretical contributions to research in this area also show steady growth. A scale for methodological standards in epidemiological research has been developed, which could be adapted for digital transformation studies. Additionally, the importance of alignment between epistemology, methodology, and method in qualitative research has been emphasized. Yung and Khoo-Lattimore (2019) stressed the importance of methodological congruence in

management research, a concept highly relevant for studying digital transformation at the village level. McMeekin et al. (2020) demonstrated how a methodological framework was developed based on evidence from a systematic review.

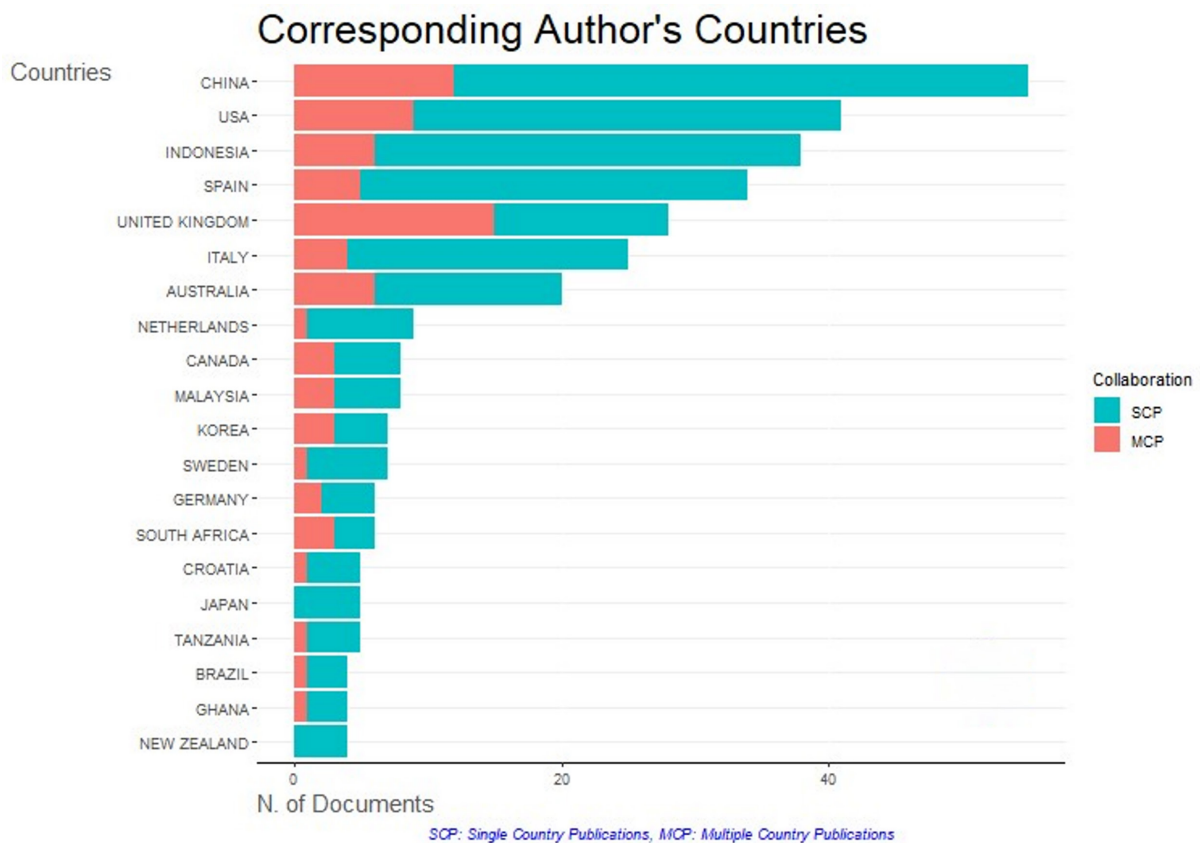
The interdisciplinary analysis in digital transformation research on village finance highlights the importance of integrating various perspectives in the development of the field. Zhang (2016) noted that the diversity of references could indicate journal interdisciplinarity, as reflected in the citation patterns of leading journals. The importance of cross-disciplinary and cross-sector collaboration for sustainability has been widely acknowledged, with indicators developed to measure interdisciplinarity based on network diversity and coherence. A text-mining approach has also been used to explore the interdisciplinarity of research projects, revealing the complexity of interdisciplinary relationships in digital transformation.

The practical implementation of research findings highlights various relevant challenges and opportunities, including the practical implications of

applying Lean Six Sigma in public administration, guidance on establishing practical contributions and conveying implications, as well as theoretical and practical issues in policy implementation, particularly in the context of the digital transformation of village finance (Chi.-Chu. Lee & Chi.-Chi. Lee, 2022).

Analysis of research development identifies key areas needing attention in digital transformation. Future opportunities exist in global contexts, emphasizing bridging the gap between practice and research. Evidence-based practices remain crucial, particularly in integrating bottom-up innovation with top-down policies at the village level.

The integration of technology and innovation in the digital transformation of village finance requires a comprehensive approach. An approach that analyzes collective and individual interdisciplinarity in advanced research groups can be applied to digital transformation studies. Li et al. (2020) identified characteristics and interactions of interdisciplinarity within the convergence paradigm, which are crucial for understanding the



**Figure 4.** Corresponding author's countries

dynamics of digital transformation at the village level. The importance of evaluating and enhancing the contribution of university research to social innovation has been highlighted, which can help develop more effective solutions for digital transformation in village finance.

Figure 4 categorizes publications based on collaboration, distinguishing between SCP (single-country publication), which refers to publications from a single country, and MCP (multi-country publication), which represents collaborative publications between countries.

Figure 4 shows that China leads with the highest number of publications, significantly dominating the graph with a large proportion of SCP. Research in China is often conducted domestically, with limited cross-country collaboration. The USA ranks second, contributing a large number of publications, most of which are MCP. This indicates that researchers in the USA are more actively engaged in international collaboration than in China. Indonesia holds third place, with a notable contribution from SCP, reflecting strong domestic interest in the topic, though research tends to be more localized. Countries like Spain, the United Kingdom, and Italy show a high level of involvement in MCP, indicating strong participation in international collaboration within this field. Other countries such as Australia, the Netherlands, Canada, and Malaysia have a moderate number of publications, with a balanced mix of SCP and MCP, suggesting a combination of both domestic and international research. Finally, Japan, Tanzania, Brazil, and Ghana have smaller contributions, with varying proportions of SCP and MCP, but their overall engagement is lower compared to the leading countries.

The bibliometric analysis reveals the dominance of China, the USA, and Indonesia in digital transformation research publications, which reflects a positive collaboration pattern between developed and developing countries. Collaboration between countries with different levels of human development is often evident in authorship order and the designation of corresponding authors. Zhou et al. (2023) emphasized the importance of government funding in fostering international collaboration, while Amarante and Zurbrigg (2024) analyzed

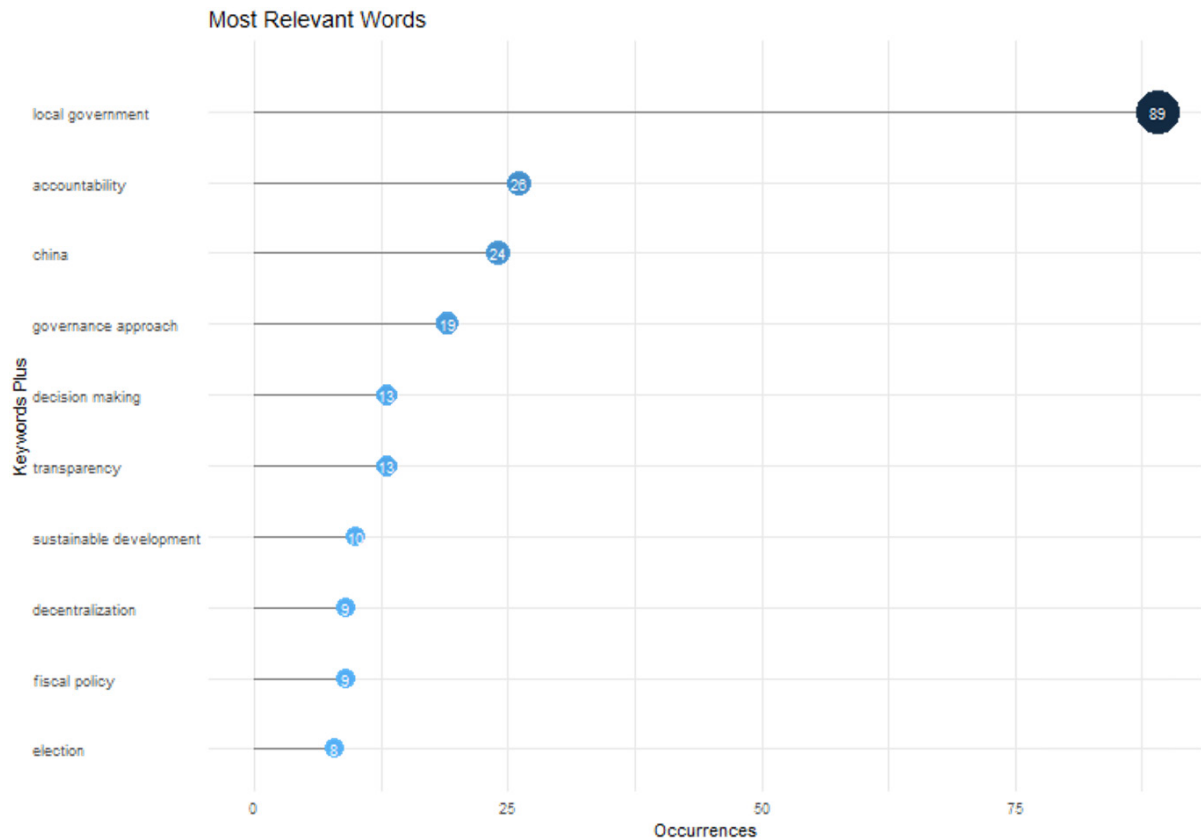
collaboration patterns in development economics. Barrios et al. (2019) found convergence in international research collaboration, while questions have been raised about whether academic research might leave developing countries.

In the regional context, Asia's contribution to digital transformation shows a positive trend. Garanina et al. (2022) analyzed digital development strategies in Global South countries amid US-China technological competition. Zhang (2016) studied the formation of networks through regional innovation between Europe and China. The Asia-Pacific region's digitalization impacts regional policy development, while Industry 4.0 implementation continues across different regions.

Practical considerations for digital transformation implementation require local adaptation. ElMassah and Mohieldin (2020) analyzed digital transformation and SDGs localization. Hanelt et al. (2020) conducted a systematic review of digital transformation literature. Models need adjustment for local contexts, considering business strategy implications and policy frameworks while addressing implementation challenges.

Research gaps in the digital transformation of village financial management highlight several priority areas. Analysis reveals uneven patterns in international research collaboration, with participation and contributions concentrated in specific countries. Leadership and dominance in research activities affect collaboration dynamics. Network analysis demonstrates that international partnerships remain geographically limited. The distribution of collaboration resources is imbalanced, which can impact research quality and relevance across different regions. Countries experiencing rapid research growth need strategic approaches to strengthen international partnerships.

Digital transformation research shows complex collaboration dynamics between developed and developing nations. Research partnerships are influenced by government funding, higher education system maturity, and research growth rates across countries. Scientists from both groups have distinct perspectives on research collaboration. Emerging technologies shape international collaboration patterns. A proactive approach remains



**Figure 5.** Most relevant words

essential to strengthen partnerships with rapidly growing research nations.

Figure 5 shows the frequency of terms used in the titles, abstracts, or keywords of the analyzed documents, offering valuable insights into the main themes explored in the literature.

Figure 5 demonstrates that “Local government” appears most frequently, with 89 occurrences, highlighting the significant focus on local government as the central actor in village financial management. “Accountability” (28 occurrences) and “Citizen” (24 occurrences) follow closely, indicating a strong research emphasis on transparency, government responsibility, and citizen involvement in local financial management. “Governance approach” (19 occurrences) points to substantial attention on governance strategies, emphasizing the role of effective policies and practices in digital transformation at the village level. Keywords like “decision-making” and “transparency” (13 occurrences each) underscore the critical role of transparent decision-making in managing public finances through digital tools. Terms with fewer

occurrences, such as “stakeholder engagement” (10 occurrences), “decentralization,” and “fiscal policy” (9 occurrences each), reflect the importance of involving stakeholders, decentralizing authority, and the role of fiscal policy in the research. “Education” (8 occurrences) suggests that capacity building and training are considered vital aspects of digital transformation in village financial management.

The prominence of local governance in digital transformation research highlights the village-level implementation context. Zhang (2016) analyzed local governance performance from a fiscal perspective in China, while Anderson et al. (2019) demonstrated that non-governmental monitoring enhances compliance with central regulations. Local governance requires effective policy implementation mechanisms while balancing accountability and social dynamics at the community level.

Aspects of accountability and transparency are key in village financial management’s digital transformation. Drew et al. (2006) emphasized transparency’s importance in environmental decision-

making, while Hochstetter et al. (2023) analyzed transparency and e-government in electronic public procurement. Digital systems must integrate values into sustainable decision-making while ensuring transparency across multi-actor processes.

Digital transformation has fundamentally changed how governments operate and deliver services to citizens. The integration of technology enables better two-way communication between government and residents. Local governments actively develop digital strategies to enhance service quality and public participation. E-government development balances social and technical aspects to ensure inclusive and sustainable systems. While technological advances create new governance opportunities, challenges like the digital divide and capacity-building needs persist. Regional collaboration and knowledge exchange remain key to accelerating government digital transformation.

Contemporary challenges in village financial management's digital transformation require a multi-dimensional approach. Pravdiuk et al. (2023) em-

phasized balancing local and distant knowledge across different village characteristics. Ordóñez-Matamoros et al. (2020) highlighted the importance of North-South and South-South collaboration for local digital transformation. Capacity building through partnerships remains crucial for implementation, while collaborative networks support innovation in disadvantaged areas. Future research should develop flexible digital transformation models that adapt to each village's unique characteristics.

Future research on collaboration in village financial management's digital transformation needs to consider geographical and institutional complexities. Hoekman et al. (2010) emphasized understanding spatial patterns of scientific collaboration for effective knowledge transfer to villages. Varshney et al. (2016) highlighted the importance of understanding local contexts in multinational research partnerships. Regional collaboration programs drive local digital transformation, while partnerships between universities and private sectors support innovation at the village level.

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## CONCLUSION

This study systematically analyzes the evolution and development of research on digital transformation in village financial management using a bibliometric approach. Based on publication data from 2015 to 2024, the study identifies emerging trends, collaboration patterns, and key themes within this field.

The study reveals a growth in research publications, with a peak in 2023. The novelty of this study lies in its focus on key themes such as accountability, transparency, local governance, and sustainable development. Additionally, the analysis underscores the importance of international collaboration, with major contributions from countries such as China, the United States, and Indonesia. The level of international collaboration in the field has reached 26.23%.

The findings have practical implications, particularly for policymakers and practitioners aiming to design and implement more effective digital transformation programs at the village level. Research recommendations include developing a framework that can be adapted to the local context and strengthening interdisciplinary and international collaboration to foster sustainable solutions. Future research directions suggest further integrating socio-cultural aspects and local capacity into digital transformation models, ensuring that their implementation is more contextual and impactful.

## AUTHOR CONTRIBUTIONS

Conceptualization: Jumaiyah, Wuryan Andayani, Rosidi, Lilik Purwanti.

Data curation: Jumaiyah, Wuryan Andayani, Rosidi, Lilik Purwanti.

Formal analysis: Jumaiyah, Wuryan Andayani, Lilik Purwanti.

Funding acquisition: Jumaiyah, Wuryan Andayani, Rosidi.

Investigation: Jumaiyah, Wuryan Andayani, Rosidi.  
Methodology: Jumaiyah, Wuryan Andayani, Lilik Purwanti.  
Project administration: Jumaiyah, Rosidi, Lilik Purwanti.  
Resources: Jumaiyah, Wuryan Andayani, Rosidi, Lilik Purwanti.  
Software: Jumaiyah, Lilik Purwanti.  
Supervision: Jumaiyah, Wuryan Andayani, Rosidi.  
Validation: Jumaiyah, Wuryan Andayani, Rosidi, Lilik Purwanti.  
Visualization: Jumaiyah, Wuryan Andayani, Rosidi, Lilik Purwanti.  
Writing – original draft: Jumaiyah, Wuryan Andayani, Rosidi, Lilik Purwanti.  
Writing – review & editing: Jumaiyah, Wuryan Andayani.

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