

The Role of Digital Payments in Enhancing Financial Inclusion: Analysing and Visualizing Research Trends

Sajan N Thomas ¹, Jobin Varghese P ², Alan Zacharia ³, Ambili Catherine Thomas ⁴,
Prageesh C. Mathew ⁵, Melby Joseph ⁶

¹ Department of Commerce, Marian College Kuttikkanam Autonomous, Kerala, India

² Department of Computer Applications, KE College Mannanam · Kottayam, India

³ Department. of Economics, St. Thomas College · Palai, India

⁴ Department of Commerce, St.Stephen's College · Uzhavoor , India

⁵ Postgraduate Department of Commerce, Newman College · Thodupuzha , India

⁶ Department of Business Administration, Marian College Kuttikkanam Autonomous, Kerala, India

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ABSTRACT

Increased adoption of digital and mobile payment technologies has reshaped the traditional topography of the financial service landscape, especially in terms of financial inclusions. This paper therefore presents the most comprehensive bibliometric analysis of available research on digital payments and financial inclusion, examining the dominant trends, themes, and collaborative patterns in the academic literature. The following analysis covers 235 publications from 190 sources in the period between 2011-2024. It shows fast growth within this area, especially in recent years. The study examines the most relevant topics, sources, and authors contributing to the field, with a focus on identifying emerging themes and gaps in the literature. The specific key research areas are financial inclusions, Fintech, and digital payments, which are central in these discussions, while blockchain and central bank digital currencies take center stage. The study further calls for the need for international collaboration on this subject, with countries like India playing an important role in driving such research output and partnerships. The review demonstrates how the research in digital financial services is evolving and points toward the future directions that such research can take; for instance, understanding the impacts of the technologies on the underserved populations and regulatory challenges. These findings provide useful insights for policy makers, financial institutions, and technology developers in the pursuit of increasing the reach of financial inclusion through digital innovations.

Keywords: Digital Payment, Financial Inclusion, Mobile Payment, Bibliometric Analysis, Biblioshiny, VOSviewer

1. Introduction

Digital payment systems have been a revolutionary force in the modern financial world, especially in the facilitation of financial inclusion [1]. Digital payments, within which come mobile payments, e-payments, and card-based transactions, have shifted from traditional cash transactions to more secure and efficient forms [2]. They do mean faster transactions, less requirement for hard cash, and increased transparency [3]. In addition, digital payment platforms can also be leveraged to engage the public in the formal financial sector; hence, expanding banking and credit services for unbanked populations [4]. This has been particularly instrumental in improving life for marginalized groups, such as women and low-income, disenfranchised individuals, because it improves finance and economic activity engagement [5].

Mobile-based phone payments, in particular, serve to actuate significant financial inclusion among developing economies. Mobile payments represent means of initiating and confirming a range of transactions using mobile

phones [6]. The adoption of these systems is pretty widespread in sub-Saharan Africa and Southeast Asia, for instance, wherein financial services are given to all those unbanked. Conclusively, these services have reduced the need to establish physical bank branches, thus extended financial services in rural and remote areas [7]. Mobile payments also contribute to small businesses and improve their inclusion in the economy through the reduction of transaction costs. Secondly, users of mobile payment systems, generally, tend to increase the level of consumption. This is because the systems provide flexible and accessible means of paying for goods and services [8].

E-payments include digital wallets and online payment services that have exhibited increasing growth, especially during the COVID-19 pandemic. The pandemic catalyzed the shift away from cash toward electronic modes of payment, given the convenience and security of e-payments. Security concerns, infrastructure limitations, and a digital divide are some issues that still need attention. Among them are such issues as digital literacy and lack of appropriate technological structure in developing countries [9]. Also, the rise of generalization in using e-payments brings about potential data privacy concerns challenging the development of regulatory frameworks.

Integrating digital payment systems into financial service integration contributes to digital financial inclusion. Digital financial inclusion has given power to the people and the small firms in developing economies through low-cost, easily accessible financial services [10]. This allows users to conduct payments, save cash, and even access credit through digital channels. These technologies have improved household consumption and further opened various other opportunities for small and medium-sized business activities. Full digital financial inclusion, however, requires the tackling of regulatory challenges by governments and financial institutions with a view to ensuring equitable access to such services for all demographics [11].

Despite these recent developments, there are multiple gaps that remain in the arena of digital payment systems. For instance, research is yet to be done on the long-term implications of digital payments on economic equity in areas where infrastructure is especially weak. Secondly, more elaborate cybersecurity needs to be developed in order to increase the trust index in e-payment systems [12]. Moreover, the digital divide continues to impede full financial inclusion, especially for the elderly and populations in such geographically dispersed areas [13].

Among the key strengths of digital payment systems, a reduction in transaction costs and enhancement of financial inclusion in poor and underserved regions can be defined. In other words, a convenient, secure, and flexible method it is for which its adoption presents no comparative choice for users ranging from individual to enterprise levels. On the other hand, security issues and a lack of appropriate regulation, which restrict further enlargement, are some of the major related weaknesses. The continuous fraud risks and data breaches, as well as generally low levels of digital literacy in most regions, are also continuous threats. Conclusion Digital and mobile payments have amply augmented financial inclusion. Notwithstanding these advances, security, infrastructure development, and digital literacy will require constructions to ensure broadened access with equity in the use of financial services [14].

Bibliometric analysis is a quantitative approach, mainly directed to the study of patterns, trends, and impact that scientific publications from individuals, groups, institutions, or even countries create [15], [16], [17]. It will involve studying citation networks, co-authorship relationships, and keyword co-occurrence in order to show the structure and evolution of research fronts in particular fields [18], [19], [20]. Additionally, it intends to evaluate the academic influence of the publications and locate the key contributors within the chosen domain.

RStudio is currently one of the most used IDEs to interact with R, and it is very well adapted for bibliometric analysis. Having a broad flexibility and strong statistical capabilities, RStudio is a perfect environment in which to perform a bibliometric analysis [21], [22]. Biblioshiny, in turn, offers an easy-to-use interface that simplifies the performance of a bibliometric analysis in RStudio by requiring only a few basics in programming [23], [24]. It provides the ability to conduct various analyses, such as citation analysis, co-citation networks, and thematic mapping, thus helping unveil patterns and trends in academic literature [25].

Moreover, VOSviewer is whatever software is applied particularly to the construction and visualization of bibliometric networks [21], [26], [27]. It is one of the most powerful tools in terms of mapping and clustering networks of authors, journals, and keywords [28], [29], [30]. VOSviewer represents complex bibliometric data in a very effective manner and thus enables one to much better grasp connections and trends in research areas [28], [31], [32].

The main contribution of this study is to attempt a bibliometric mapping of the overall research landscape on digital payments and financial inclusion. More precisely, this work tries to show the major trends, themes, and collaboration patterns in the academic literature of the subject matter. It also tends to analyze the growth in scientific production of this field, which puts in evidence the most influential authors and sources, as well as the shifting emphasis of research topics these times. It also aims to discuss emerging themes, identify research gaps, and study the impact of blockchain and digital currencies on how these innovations are shaping up the future of financial inclusion. All this while, the study undertakes to provide guidance to policymakers, financial institutions, technology developers, and other stakeholders on what these findings practically mean for future research and policymaking toward improving financial inclusion with digital technologies.

2. Materials and Methods

In this study, publications were gathered using the query (TITLE-ABS-KEY ("digital payment") OR TITLE-ABS-KEY ("mobile payment") OR TITLE-ABS-KEY ("e payment") AND TITLE-ABS-KEY ("financial inclusion")) from multiple sources, without imposing language restrictions, focusing primarily on journal articles, book chapters, and conference papers. A total of 235 documents from 190 distinct sources, spanning the years 2011 to 2024, were identified. To maintain a more targeted dataset, reviews, editorials, letters, notes, and short surveys were excluded, leaving only the relevant articles, book chapters, and conference papers for analysis. The refined dataset was saved in a CSV file and analyzed using VOSviewer and Biblioshiny to uncover key trends and patterns in the research.

Table 1 provides a detailed summary of the main characteristics of the dataset analyzed in this study. The dataset analyzed in this study spans the period from 2011 to 2024, encompassing 190 different sources, including journals, books, and conference papers, resulting in a total of 235 documents. The data shows a notable annual growth rate of 37.87%, reflecting a substantial increase in research output over time. The average age of the documents is 2.17 years, indicating a relatively recent focus on the topic. On average, each document received 9.613 citations, contributing to a total of 10,894 references within the dataset, demonstrating the robust academic interest in this area. The document contents include 695 Keywords Plus and 693 Author's Keywords, highlighting the diversity of topics covered within the research. Authorship is also widespread, with 641 unique authors contributing to the dataset, though only 40 documents are single-authored, reflecting a high level of collaboration. On average, there are 2.93 co-authors per document, with 22.98% of the documents involving international co-authorship, indicating significant cross-border research collaboration. In terms of document types, the dataset is composed of 153 journal articles, 32 book chapters, and 50 conference papers, emphasizing a broad distribution of research outputs across various publication formats. Overall, the dataset provides a comprehensive view of the research landscape, highlighting key trends, collaboration patterns, and the evolving focus on digital and mobile payment systems in the context of financial inclusion.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2011:2024
Sources (Journals, Books, etc)	190
Documents	235
Annual Growth Rate %	37.87
Document Average Age	2.17

Average citations per doc	9.613
References	10894
DOCUMENT CONTENTS	
Keywords Plus (ID)	695
Author's Keywords (DE)	693
AUTHORS	
Authors	641
Authors of single-authored docs	40
AUTHORS COLLABORATION	
Single-authored docs	40
Co-Authors per Doc	2.93
International co-authorships %	22.98
DOCUMENT TYPES	
article	153
book chapter	32
conference paper	50

Table 1. Main aspects of the study

3. Results

3.1. Annual scientific production

Figure 1 depicts the annual scientific production in terms of the number of articles published over the period 2011-2024. From the trend of this graph, the scientific output is observed to increase gradually, with a remarkable growth in production observed starting from the year 2018. Starting from the year 2020, the production further accelerated, reaching a value of over 60 articles by the year 2024. Such a steep increase could be credited to increased interest among researchers in the relevant field, possibly rooted in recent developments of topics of digital and mobile payment methods, financial inclusion, and so on. This slow increase in the early years, and steep growth in the later years, may indicate that research is expanding its focus probably due to technological and financial innovations.

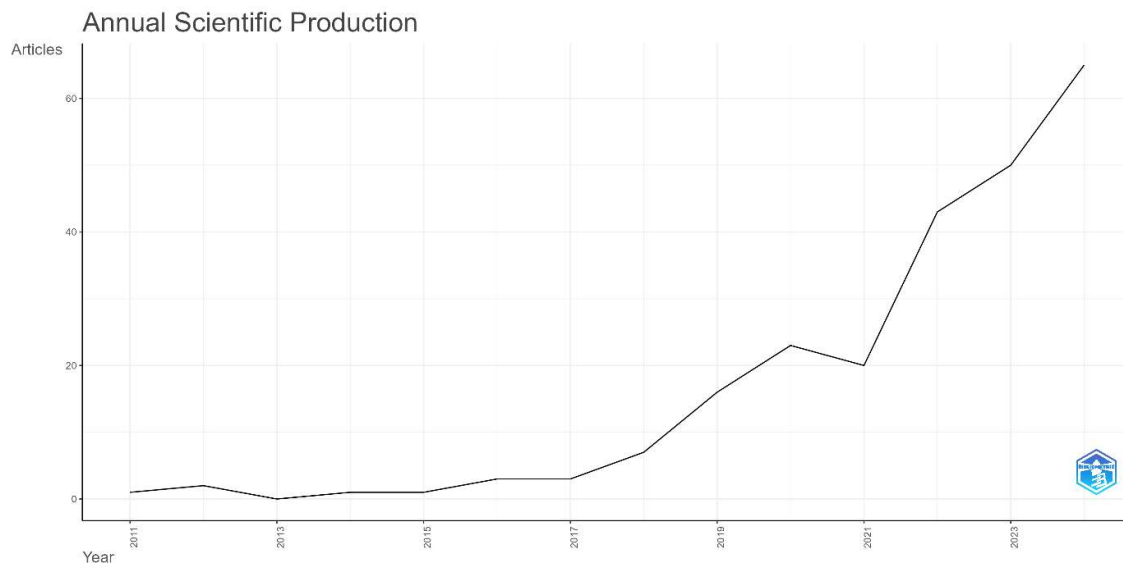


Figure 1. Annual Scientific Production

3.2. Most Relevant Authors

Table 2 presents the relevant authors contributing to the dataset. Each of the listed authors has published more than one article on the subject. Both Pal A and Wang X lead the list, with 4 articles each, demonstrating significant contribution into the field of research. Many other listed authors, including Al-Okaily M, De' R, Herath T, Rao HR, and Singh P, have contributed 3 articles each. Authors like Abutaber TA, Agarwal B, and Akanfe O have 2 articles to their credit. These authors are part of the grey literature on digital payments and financial inclusion which is helping to shape the trend and patterns observed in the research area. The distribution indicates collaborative research by a few consistent publishing researchers.

Authors	Articles
Pal A	4
Wang X	4
Al-Okaily M	3
De' R	3
Herath T	3
Rao HR	3
Singh P	3
Abutaber TA	2
Agarwal B	2
Akanfe O	2

Table 2. Most Relevant Authors

3.3. Most Relevant Sources

Table 3 provides an overview of the most relevant sources in which articles related to the study were published. Lecture Notes in Networks and Systems opens with 10 articles, closely followed by the Journal of Payments Strategy and Systems with 7 articles. The International Journal of Bank Marketing and Sustainability Switzerland have contributed 5 articles each, evidence of their leading role in the diffusion of researches concerning digital payments and financial inclusion. Other important sources include ACM International Conference Proceeding Series, Australasian Accounting, Business and Finance Journal, and IFIP Advances in Information and Communication Technology, at 3 articles each. The other journals which add 2-3 articles each are Information Technology for Development, PLOS One, and Asia Pacific Journal of Information Systems. In all, this distribution does point out the diversity of the journals and conference proceedings that play a significant role in the publication of key findings within the interdisciplinary nature of the research.

Sources	Articles
Lecture Notes in Networks and Systems	10
Journal of Payments Strategy and Systems	7
International Journal of Bank Marketing	5
Sustainability (Switzerland)	5
ACM International Conference Proceeding Series	3
Australasian Accounting, Business and Finance Journal	3
IFIP Advances in Information and Communication Technology	3
Information Technology for Development	3
PLOS One	3
Asia Pacific Journal of Information Systems	2

Table 3. Most Relevant Sources

3.3. Trend Topics

Figure 2 represents the evolution of trending topics over the entire dataset; it offers a very detailed view of each

key term with its frequency for the time span from the year 2018 to 2024. In particular, among the highest frequency terms are digital financial services, digital finance, and fintech-all of which show high relevance along the period analyzed in the most recent years. Other leading topics which follow closely in superiority are digital financial inclusion, financial inclusion, and digital payments, reflecting the increased research interest in the interactions of technology and financial access. COVID-19 also features as a key topic, particularly post-2020, reflecting how the pandemic has set the tone in discussions on digital financial services and inclusion. Other terms to feature prominently in the literature included mobile payment, blockchain, and mobile payments, for which blockchain is very likely to reflect interest in decentralized finance technologies. The size of the circles is relative to term frequency, with larger circles indicating more frequently occurring terms. We find this a really useful way of seeing the changes in research focus; some topics have gained much more traction in recent years, such as those related to digital finance and financial inclusion, reflecting probably the ongoing digital transformation of financial services.

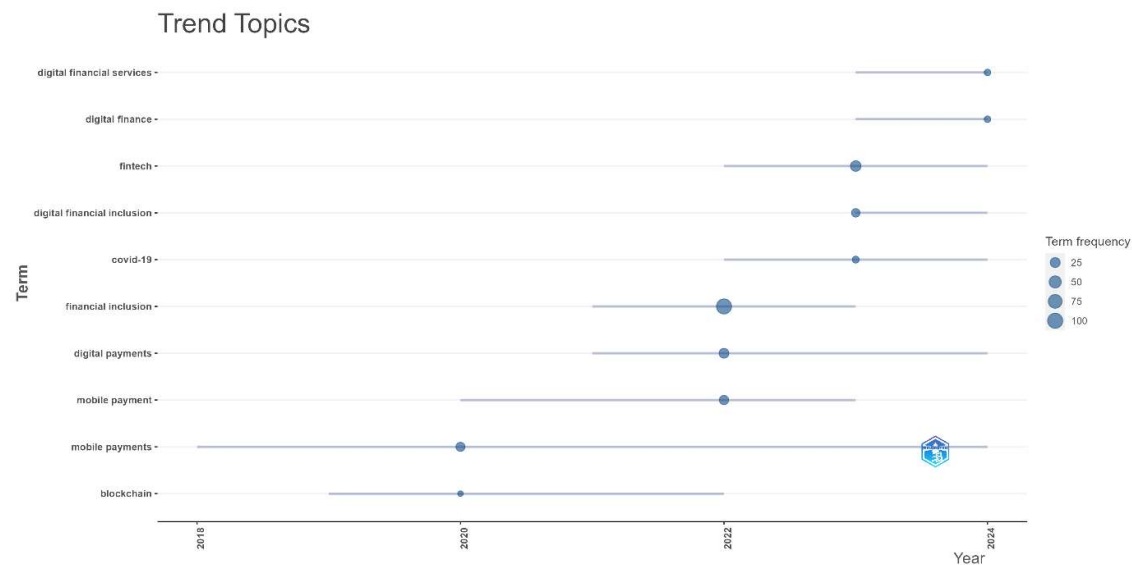


Figure 2. Trend Topics

3.4. Thematic Map

Figure 3 shows a thematic map of the various research themes in the domain of digital payments and financial inclusion, ordered by their centrality and density. Their dispersion in four quadrants designates the different levels of importance and development within the research field. The top-right quadrant indicates Motor Themes with high relevance. These are: financial inclusion, fintech, digital payments, which are at the core of the present discourse in this field. Other core topics like mobile payments, digital financial inclusion, and financial services take residence in this quadrant, epitomizing their critical contribution and role in advancing digital finance for the future. These motor themes are the driving force within the research landscape and are expected to be continued to grow.

In the top-left quadrant, the Niche Themes represent topics that are highly developed but less central to the general field. Terms like trust, mobile wallet, and adoption are related to very specialized areas of investigation, often connected with specific aspects of digital finance. Mobile banking and cashless economy are other terms in this quadrant, indicating highly concentrated research effort on these themes, though not necessarily as influential in the greater scheme as would be the motor themes.

Emerging or Declining Themes displays words with low centrality and low development, either because they are new and emerging or, vice-versa, are losing their relevance. Key terms emerging in this category include unbanked, financial exclusion, digital finance, and banking, which may indicate these areas of research that are still evolving. Other topics, such as m-payment and China, can also be found in this group, which could point to new, emerging topics or, on the other hand, the ones that are slowly becoming less of a focus.

The last quadrant, Basic Themes, covers themes that are central to the field but need development in depth. Among these are the digital payment, financial technology, and digital financial services of the founding ideas grounding

the study of digital finance. While they are central to grasping the general research landscape, they are themes that might be developed further through research in order to obtain all their possible potential. In an overall sense, the thematic map gives the viewer a clear sense of the core and emerging, niche, and underdeveloped themes within the study of digital payments and financial inclusion. It looks at forces that drive the field but, in turn, locates areas which therefore might need special attention or further research.

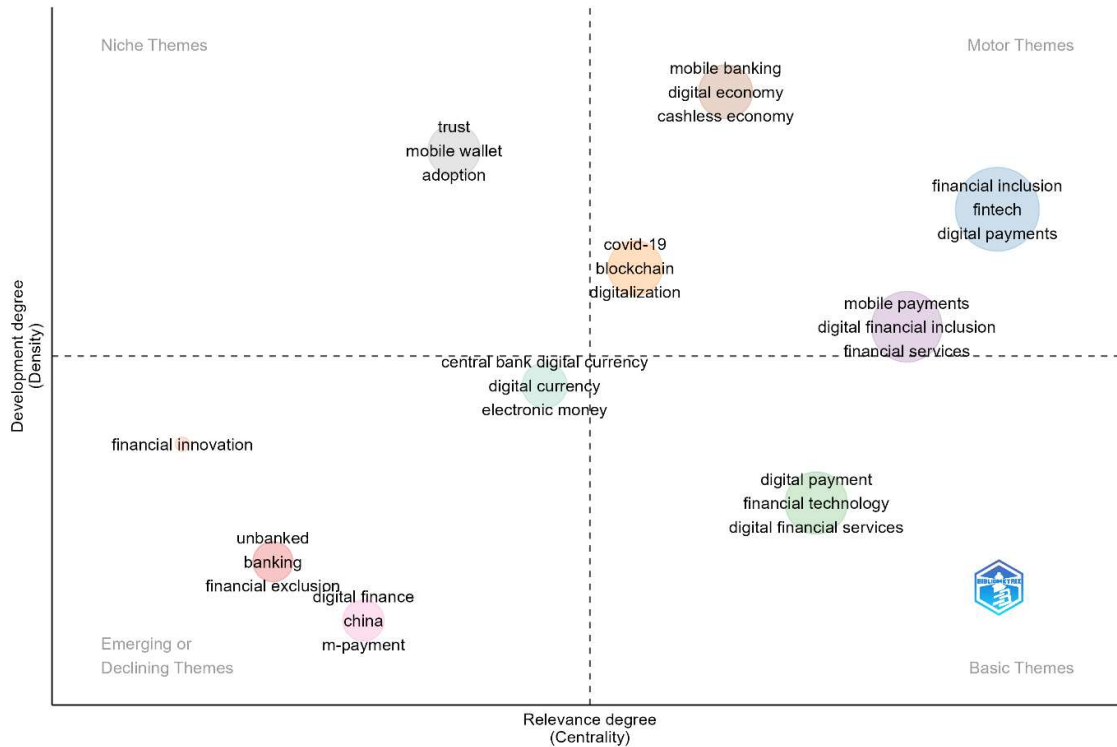


Figure 3. Thematic Map

3.5. Countries Scientific Production

Figure 4 shows a world map in which countries are differentiated by scientific production in terms of digital payments and financial inclusion. The shading of blue for a country in the map is the level of this production, ranging from less intense. India, therefore, represents the most productive country with the darkest blue shading, which portrays a very high number of research publications for this field. It is then followed by the United States as a major contributing nation, along with powerhouse countries in Europe, such as the UK, Germany, and Italy. Other areas which seem to have high contributions are China, Australia, and bits of Africa-for instance, South Africa. This map reflects the global interest in both digital financial services and financial inclusion-one that is both developed and developing in nature-in this research landscape. The occurrence of countries, including India and the United States, suggests that these regions are very active in research and development into digital payment technologies and financial inclusive initiatives. Contributions from other regions express a growing level of awareness and engagement with the topics under discussion, therefore indicating their global relevance.

Country Scientific Production

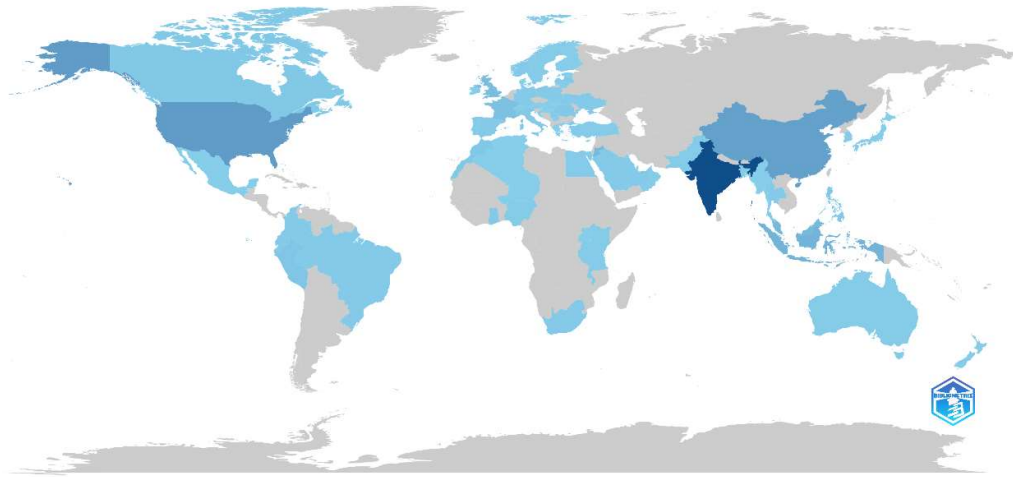


Figure 4. Countries Scientific Production

3.6. Co-authorship between Countries

Figure 5 shows a co-authorship network of countries regarding the collaborative relationship between them in the field of research on digital payments and financial inclusion. The node size reflects the degree of a country's participation, linked by lines to a node to represent the strength and presence of co-authorship links within a set of countries. India comes out as one of the central hubs, collaborating a great deal especially with Canada, Nigeria, Pakistan, and the United Kingdom. The strong linkage speaks to the fact that India is one of the key drivers of international research collaboration in this field. Other notable countries are Indonesia, in collaboration with Vietnam and other nearby nations, indicating regional research partnerships. On the other hand, China also displays collaborative activity, but its network appears to be more regional and less diffused compared to India. The United Kingdom and France exhibit smaller but relevant nodes, indicating involvement in the global research effort but with fewer collaborations compared to India. The map visually displays how some countries act as regional and even global research hubs, with India acting at the very forefront to encourage cross-country collaboration in research on digital payments and financial inclusion.

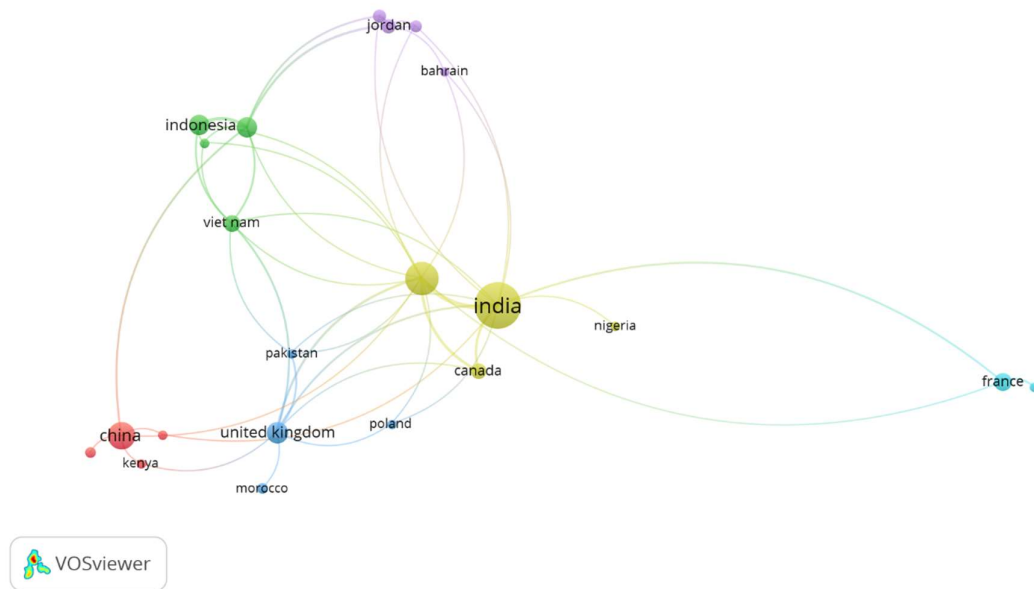


Figure 5. Co-authorship between Countries
3.7. Co-occurrence of keywords

Figure 6 presents a word co-occurrence map for the research area of digital payments and financial inclusion. Also, it reflects the network properties of the relations between keywords. The size of each node corresponds with the frequency of occurrence of a keyword, while the lines in connections between nodes express the strength of a relationship between keywords. The most frequent co-occurent in the middle of the network seems to be financial inclusion, which appears to be strongly connected with other key concepts: fintech, digital payments, financial services, and financial technology. This means that the concept of financial inclusion occupies a central place in the general research on digital financial services. Other major clusters include electronic money, mobile payments, and mobile banking, which in most instances indicates that they are closely related to financial inclusion. Such terms are normally researched together, especially when relating to increased digital and mobile financial services targeted at increasing access to financial resources. The network also reflects the emergence of recent trends like blockchain and central bank digital currency, linked to broader themes such as digital finance and innovation. COVID-19 is also among the relevant keywords, showing the relevance of this pandemic to digitalization and financial services. On the whole, it is a dense, interconnected map in which themes of research such as financial literacy, technology adoption, trust, and mobile wallets interact with core Financial Inclusion and FinTech themes. The co-occurrence map of this paper well represents the multifaceted nature of the field of research; diverse areas of inquiries converge on how to foster financial inclusion by using digital technologies.

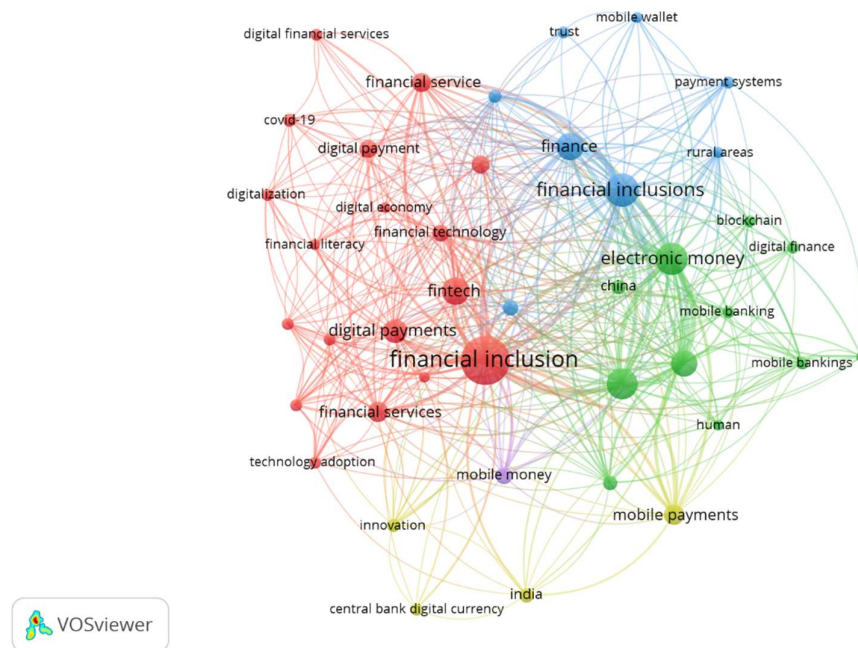


Figure 6. Co-occurrence of keywords

4. Discussion

The study reveals that annual scientific production has a significant increasing trend of research on digital payments and financial inclusions, which has been more apparent since 2018. Such is due to increasing adoption and applications of digital and mobile payment solutions that have been accelerated through global financial inclusions and the rapid development of a variety of FinTech technologies. Thematic analysis shows that the motor themes of financial inclusion, fin-tech, and digital payments are at the core of the current research discourse, indicating their prime place in driving innovation in financial services, especially within developing regions.

This co-authorship network structurally points out that India is leading both in scientific production and international collaboration by establishing strong research collaboration with the likes of Canada, Nigeria, and the UK. The other regions, China and Southeast Asia, are also important, yet their respective collaborations are more regionally concentrated. Indeed, the keyword co-occurrence map shows that financial inclusion is interwoven with other key concepts besides fintech, such as digital payments and mobile banking, reflecting the interdisciplinary nature of research in this area. It also highlights the more recent emerging trends-highlights of blockchain, central bank digital currencies, and the impact of COVID-19 on financial services-that have taken center stage in the last few years. These further illustrate the often dynamic and constantly evolving nature of research into digital financial services, especially with regard to meeting global challenges on financial access and inclusion.

5. Research Gaps and Future Directions

In spite of the overwhelming studies on digital payments and financial inclusions, a variety of gaps still remain. First, longer-term research is required on the impacts of digital financial services on vulnerable sections, especially in rural or otherwise underserved areas. While topics such as mobile payments and digital wallets have become highly topical, little is known about how such technologies impact the financial stability and well-being of their users over long periods. Further research is needed regarding their added value in the realm of financial inclusiveness, particularly with respect to the new roles of blockchain and central bank digital currencies. Indeed,

more research is needed on how these technologies could be used to extend financial services in developing countries.

Another gap is that only a few studies have focused on regulatory frameworks and their impact on the adoption and diffusion process of digital payment systems. Future studies need to delve into how policy and regulation facilitate or block the deployment of digital financial technologies, particularly in emerging markets. Finally, deliberation is needed regarding trust and security issues in the making of digital payments. As the financial digital systems continue to grow, it would be of utmost importance to understand the mechanisms whereby trust is built or eroded, especially under crossborder environments and low-trust conditions, to ensure wide diffusion.

6. Practical Implications

These results have important practical implications for policymakers, financial institutions, and developers of technologies. First, financial inclusion centrality requires the design of target policies, which aim to incentivize the use of digital payments in disadvantaged communities. Both governments and financial institutions should ensure that investments in digital infrastructure and fintech solutions reflect the needs for bridging gaps in financial access. This, therefore, outlines to the fintech companies and developers that when initiating the digital payment systems, they must ensure it focuses on user experience and security. While rural and low-income areas still face particularly significant challenges in building trust and driving adoption, creating user-friendly and secure platforms will be of great importance in encouraging uptake of the digital financial services.

It is in regard to this that, with blockchain and digital currencies being some of the highlighted subjects, their potential use by financial institutions could seek to offer more inclusive financial ecosystems. Blockchain-based solutions may give full transparency and a reduction in transaction costs, thereby especially benefiting the underprivileged classes in cross-border payments. The cooperative nature of research, reflected in the co-authorship networks, underlines the importance of country cooperation on issues of digital financial service development. It will, therefore, be inherently suggestive of an international collaboration at the policy level regarding the comparison of best practices, aligning regulatory issues, and encouraging innovation in methods of digital payment.

7. Conclusion

This study carries out a thorough bibliometric analysis of the main trends, themes, and collaboration patterns in research on digital payments and financial inclusion. The scientific production is growing very fast, especially after 2018, reflecting the importance of digital financial services to improve financial inclusion worldwide. Some of the core identified areas of research that have been catalyzing innovation and shaping the future of financial services are financial inclusion, fintech, and digital payments. However, gaps remain regarding the long-term impact of DFS on vulnerable populations, regulatory capture, and the role of emerging technologies such as blockchain in financial inclusion. Addressing these knowledge gaps with future research can yield the important insights necessary in the ever-evolving landscape of digital finance. In practical terms, the findings advocate for focused policies, secure digital platforms, and global collaboration as key components in providing an enabling environment for the successful adoption of digital payments in ways that promote global financial inclusion. As this landscape continues to evolve, further research into new technologies and their promise in tackling the most critical global financial challenges will be crucial in the development of the future of digital financial services.

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