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Trends in the Literature About the Adoption of Digital Banking in Emerging Economies: A Bibliometric Analysis

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Abstract: This study examines the trends in the literature about adopting digital banking in emerging economies. It is based on the concepts of digital transformation and technological adoption, which significantly impact the development of the banking industry. A quantitative approach was used through a bibliometric analysis using data from Scopus to achieve the objective. The search equation allowed 118 publications to be extracted and analyzed. The results show that digital banking in emerging countries is a growing field of research that has driven the introduction of new information technologies. The perceived usefulness of digital banking is a key factor in promoting its adoption in the market. Attributes such as security and trust were identified as affecting the level of user satisfaction. Most studies are based on technological adoption, where perceived risk, usefulness, and ease of use are key to understanding the intention to use these technologies. Some countries' concerns about financial inclusion, cyber security, and trust in financial technology are evident. While digital banking has the potential to increase the coverage of financial services, there are concerns about cybersecurity risks and user data protection.

Keywords: digital banking; technological adoption; emerging economies; bibliometric analysis

1. Introduction

Information technologies have transformed the competitive dynamics of industries worldwide and how value is delivered to the customer. The banking sector is no exception. Technological advances have generated significant transformations in the financial system (Rahi et al. 2021). The growth of these technologies has been exponential and has had considerable effects on this sector (Shaikh et al. 2020). The introduction of new business models in the financial sector in fintech format has generated contributions to the development of the operation of banking establishments and has also generated competitive pressures in the industry. According to (Phan et al. 2020), fintech companies are likely to trigger a substitution effect, and banks will probably have to divest part of their business activity. This is not a minor concern for participants in the banking industry; since 2008, global fintech activity has been growing, and customers now have multiple alternatives to receive personalized and secure banking experiences (Wewege et al. 2020).

Banks have developed strategies to boost business by adopting new technologies. Innovations in financial products and services, such as real-time payments, online lending, or financial services through mobile platforms, have experienced explosive growth (Allen et al. 2022). Internet-based e-banking has become an alternative channel that offers convenience to the user, facilitating 24-hour service delivery anywhere through a digital banking website (Rahi et al. 2021). Banks have evidenced the potentiality of digital channels, resulting in increased mobile and online banking platforms, with solutions for Internet and smartphone users (Wewege et al. 2020). Banks have also developed new models of

electronic, e-financing, and cell phone financing (Shaikh et al. 2020). These technologies allow bank customers to pay their commercial bills, make online purchases, transfer funds, and generate bank statements through a website (Rahi et al. 2021).

Banks spend more money on IT investments than other sectors (Kitsios et al. 2021; Scott et al. 2017). Digital transformation empowers new banking establishments to offer new service channels through technology platforms and points of service and enables them to reduce operating costs (Kitsios et al. 2021). However, although the benefits of new information technologies bring opportunities, they also represent challenges for the banking business (Miskam et al. 2019). Digitization involves substantial costs. Therefore, it may not be financially viable or compromise the bank's stability due to increased technical and regulatory risk (Khattak et al. 2023). Managers should systematically evaluate these investments because they could commit funds that can be used to finance other strategic activities.

Some studies show the effect of information technologies on bank profitability. For example, (Le and Ngo 2020) pointed out that IT-based products can improve bank profitability. (Del Gaudio et al. 2020) also found evidence of a positive relationship between bank profitability and the adoption of information and communication technologies, ICT. The authors stressed the importance of the diffusion of these technologies. Therefore, strong government policies are required to safeguard the security of user data, as well as measures that favor open platforms and encourage innovation processes. Some countries have developed government programs and initiatives, including the possibility of financing fintech companies; however, only in some countries have these technologies been accompanied by a regulatory framework (Tsindeliani et al. 2021).

Therefore, this study aims to examine the trends in the literature about digital banking in emerging countries through a bibliometric analysis. In this way, it seeks to provide an overview of the factors that best characterize the academic production in this field of knowledge. This bibliometric analysis contributes to identifying the main trends in the literature about the adoption of digital banking in emerging countries. To this end, it analyzes the prevalent topics over time using thematic mapping. In addition, characterization of the main countries, institutions, authors, and academic collaboration networks with the greatest impact is carried out. This study contributes to identifying the influence of research centers on developing cooperation strategies, formulating public research policies, and new projects based on the contributions of the main experts or referents in the area. The context of analysis is emerging economies, considering that these countries experience lower levels of financial inclusion than advanced economies (Finkelstein-Shapiro et al. 2022).

In addition, fintech companies have made an important contribution to closing this gap since their business model, leveraged on digital technologies, makes it possible to provide financial services to individuals and companies that cannot participate in the traditional financial system (Finkelstein-Shapiro et al. 2022). For this purpose, the number of publications, the geographical nodes of greatest academic production, the impact of the authors, thematic areas, and knowledge networks are analyzed. This study is relevant due to the increase in publications related to digital transformation in the banking sector, such as digital banking, mobile banking, open banking, digital payments, and digital wallets, among other products. Therefore, a bibliometric analysis helps to address this gap in the academic literature as it allows the grouping of fragmented knowledge from different domains according to their similarity and relatedness (Ren et al. 2020).

This study generates a significant contribution to researchers interested in recognizing trends and knowledge gaps related to the adoption of digital banking. In addition, higher education institutions and governments can take advantage of the results of this study to identify critical areas of research that can impact strategic sectors of countries with emerging economies and on which projects can be linked and funds can be allocated efficiently. Along these lines, (Garg et al. 2023) stated that bibliometric studies help to identify knowledge gaps, examine the research conducted in some countries on a given topic, and identify those countries that need to be studied. These studies also provide valuable information

on the current state of knowledge and provide directions for future research (Dissanayake et al. 2023). In addition, bibliometric studies apply statistical techniques that can be used to identify key topics in a field of knowledge, examine their influence, and recognize emerging areas (Parker et al. 2023).

This study differs from previous studies, which have characterized the academic literature on technologies and innovation in the financial industry based on bibliometric data. Unlike (Dissanayake et al. 2023), who addressed the concept of fintech in a general way, in this study, the object of analysis is specific since it is literature related to the adoption of digital banking in emerging countries. These technologies can have a significant impact on areas such as inclusion and financial literacy, which are necessary for the development of emerging economies. A study along these lines was developed by Aziz et al. (2021). However, the authors focused on analyzing patterns of publications, authors, geographic affiliation, and topics, while this study identifies specific thematic trends that may constitute future lines of research. On the other hand, although (Tuli 2023) studied the obstacles that impede the adoption of digital banking technologies in emerging economies, the author focused his analysis on the Asian context.

The paper is organized as follows. First, the theoretical foundation related to information technologies in the banking sector is addressed. A conceptual analysis of digital banking and its theoretical and empirical approaches is made. Secondly, the methodological strategy for data collection and bibliometric analysis is presented. A search equation was developed to collect publications that address digital banking in the context of emerging economies. A sample of 123 documents published from 1992 to 2023 was obtained. A bibliometric analysis was performed by mapping knowledge, considering the evolution of academic productivity, the main research centers on the subject, authors, and publications with the highest impact, and co-occurrence networks allow the dimensioning of this domain. Thirdly, an analysis and discussion of the results are proposed to identify patterns and trends related to the object of study. Finally, the conclusions are presented.

2. Theoretical Foundation

2.1. The Digital Transformation of the Banking Business

Digital transformation is a process of integration of technologies and digital solutions in companies which has driven the development of applications to facilitate user operations, in addition to making transactions between the parties involved faster, more efficient, and more secure. In the banking sector, this transformation can be documented in initiatives such as those of the Bank of Scotland (Loyds Banking Group n.d.), which in 1959 became the first bank in the United Kingdom to use a computer to process its accounts centrally. By 1985, before the Internet was available, it was the first institution to offer its customers electronic banking services from home. All they needed was a television screen and a telephone connection. (Wewege et al. 2020) reported that Stanford Federal Credit Union in the United States became the first online bank in 1994. Currently, 80% of U.S. banks offer their customers the possibility of online banking (Napoletano and Whiteman 2021), which has contributed to a significant reduction in the number of physical branches around the world (Wewege et al. 2020).

The integration of technologies into the different activities of the banking business has been consolidated as a transformation process that has significantly impacted the industry. According to (Khattak et al. 2023), this digital transformation process will affect commercial banks internally and externally. External digital transformation implies that non-banking firms can offer digital services such as traditional banking. Internal digital transformation relates to the adoption of advanced technologies. These technologies include artificial intelligence, blockchain, big data, cloud computing technology, etc. These technologies are driving innovation in the banking sector, to the extent that they offer opportunities to facilitate customer transactions, product customization, and security in service delivery.

Although digital transformation considerably impacts the banking sector, strong regulation is required to ensure customer security, transaction integrity, and personal data

protection. According to (Tsindeliani et al. 2021), government intervention in the banking sector is necessary at all stages given the inevitable digitalization. Currently, many cases of unauthorized companies offering financial services related to financial technology startups have been reported (Balyuk and Davydenko 2023). Considering the above, the lack of regulation on digital transformation is a cause for concern in the financial sector, as it has considerable implications for the system's stability. These technologies should reduce the possibility of illegal activities seeping into the system, and governments have a key role to define and enforce consumer protection regulations (Demirguc-Kunt et al. 2021).

2.2. Digital Banking and Its Modalities

According to Sharma (2017), digital banking involves leveraging technology to offer banking products and adopting the latest technologies at all functional levels and across all service delivery platforms. According to Ananda et al. (2020), factors such as easy access to the Internet, the increased number of online users, cost efficiency, convenience, and cost-effectiveness have encouraged greater adoption of e-banking. A digital bank offers similar benefits to a physical branch. Digital banking is not just about mobile platforms or online transactions; it can be applied in other functional areas of the bank. The online or mobile platform is only the interface of the platform. There are hundreds of banking functions such as risk management, treasury, product development, etc., that take place at the trading desk and the settlement desk. All these activities are also susceptible to digitization. Recently, some technological trends have been consolidated in the banking industry:

- Mobile banking or m-banking: Allows 24-hour remote access to finances on a mobile device such as a smartphone or tablet (Sorbet 2022). Through mobile devices, a broad suite of services can be accessed to enable individuals to manage money.
- Open banking: It has been considered the platform of the retail banking industry. The essence of open banking is to recognize the right of banking customers to share their transactional data with authorized third parties (O'Leary et al. 2021). This model is a vector to drive the transformation of the banking industry into an open platform model, as has happened in industries such as telecommunications.
- Cloud-based banking or cloud banking: Refers to the implementation and management of banking infrastructure to control cloud-based core banking operations and financial services without dedicated physical servers (Shatalova and Huseynov 2021). Cloud technology is a model that provides on-demand access to a box of configurable resources that can be rapidly provisioned, scaled, and released with minimal operational costs by contacting the provider.

2.3. Impact of Digital Technologies on Banking Business Performance

At the theoretical level, few studies have proposed a model or approach to explain the performance of the banking business in terms of digital technologies since most studies focus on analyzing technology adoption or the impact of digital solutions in specific areas. However, some works have identified some theoretical approaches that contribute to explaining the impact of these technologies on the performance of these businesses. For example, (Zhu and Jin 2023) referred to the theory of externalities, which explains how digital transformation can reduce the negative externalities caused by banks. Another perspective that explains this impact is the theory of technological innovation, which explains how digital technology has promoted innovation in commercial banks and how this leads to significantly reduced costs, improves efficiency in information gathering, supports decision making, and improves operations management (Zhu and Jin 2023). In contrast, (Le and Pham 2022) mentioned that, based on the theory of efficiency and cost, the acquisition of technology does not increase the efficiency of the banking business, since it is necessary for banks to be able to comprehensively combine the system of technical and social factors within the organization.

Some studies explain the performance of the banking business from an empirical point of view. According to (Koroleva and Kudryavtseva 2020), three approaches to the economic

efficiency of banking organizations are identified in the academic literature. The first is based on financial reporting, characterized by flexibility, but does not allow a probabilistic evaluation of the results. The second method is inquiry with experts, which, according to the authors, is the most applicable for performance analysis but faces the problem of subjectivity in the evaluation. In addition, there is a recent trend towards econometric models, which, despite difficulties in their construction, tend to be more objective and help identify dependency relationships in the variables and analyze long-term trends. The authors consider that regression models are a reasonable alternative for evaluating the performance of digital banks because they allow for estimating the impact of variables on profitability measures.

(Koroleva and Kudryavtseva 2020) found a positive impact of digital banking features on the performance of Russian banks, using ROA as an endogenous variable. Specifically, a positive and statistically significant relationship was evident when relating the number of users and online banking transactions to the performance variable. (Scott et al. 2017) found a positive effect of the adoption of financial technologies such as SWIFT on banks' performance, measured in terms of profit margin. However, some papers have found evidence that contrasts with these findings. (Nguyen-Thi-Huong et al. 2023) observed a negative impact of the digital transformation process on performance measures such as ROA and ROE. The authors explained this result as being due to the significant investment represented by technology adoption, the business results of which cannot be seen immediately. Meanwhile, (Phan et al. 2020) analyzed the effect of fintech growth on banking business performance. The authors used panel data of 41 banks and analyzed the effect on different financial performance measures such as return on assets (ROA), return on equity (ROE), net interest income to asset ratio (NIM), and return on income earning assets (YEA). The results revealed a negative impact on all performance measures.

3. Materials and Methods

A bibliometric study was carried out with a quantitative approach and longitudinal design. An analysis was carried out based on numerical data, which are susceptible to statistical analysis. In addition, the publications under study date from 1992 to 2023. Therefore, bibliometric data of works up to 31 years old are addressed. In this way, it is possible to analyze the evolution of this field of knowledge over time, which allows for a deeper understanding of the characteristics of bibliographic production (Forliano et al. 2021). With the above, the aim was to have objective and quantifiable information on the impact, evolution, and degree of dissemination of research related to digital banking in emerging countries.

According to (Donthu et al. 2021), scholars apply bibliometric analysis to discover emerging trends in areas of study, collaboration patterns, and research components that allow for exploring the intellectual structure of a specific domain of literature. In addition, bibliometric studies contribute to mapping large volumes of scientific literature, allowing the application of rigorous techniques that guarantee the quality of the information and the results generated (Nobanee et al. 2021). In business research, bibliometric studies have gained considerable popularity as they allow for handling large volumes of scientific data and produce a high research impact (Donthu et al. 2021).

This study maps the bibliographic production related to digital banking in emerging countries. To this end, a search equation was constructed to address the two main categories of analysis, as shown in Table 1. To compile an important bibliometric database, terms related to each category were identified based on the titles, abstracts, and keywords. The database chosen to conduct this study was Scopus, a source of quality and reliability for bibliographic extraction, with wide coverage for collecting information and easy access to data (Herrera-Franco et al. 2020).

Table 1. Analysis categories.

Category	Related Term [1]
Digital Banking	Digital Bank, Online Bank, Internet Bank, Electronic Bank, Virtual Bank, E-bank
Emerging Economy	Emerging Economy, Developing Economy, Emerging Market

[1] The information query was based on the terms corresponding to each category.

Once the study categories and query terms were defined, the search equation was developed. Then, publications corresponding to the intersection of digital banking and emerging economies could be identified. Scopus was consulted and 128 documents were obtained; however, a filter was applied for the year of publication to exclude those corresponding to 2024. This is the year this study was conducted, so not all published studies would be available for bibliometric analysis. The search equation was defined as shown in Table 2, allowing 118 publications to be obtained to conduct the study.

Table 2. Search equation.

Database	Search Equation
Scopus	(TITLE-ABS-KEY (("digital bank*" OR "online bank*" OR "internet bank*" OR "electronic bank*" OR "virtual bank*" OR e-banking)) AND TITLE-ABS-KEY (("emerging econom*" OR "developing econom*" OR "emerging market*"))) AND PUBYEAR > 1991 AND PUBYEAR < 2024

Note: The Boolean AND and OR indicators and the reserved symbols * and "" were used to construct the search equation.

To conduct this bibliometric study in a structured manner, a protocol for consultation, purification, systematization, and presentation of the results of the bibliometric analysis was developed. This procedural framework for conducting studies of this nature is usually applied in different jobs in the field of management (Farooq 2022; Forliano et al. 2021; Nobanee et al. 2021; Herrera-Franco et al. 2020). For this study, the protocol proposed by (Donthu et al. 2021), who systematized some recommendations for carrying out this analysis in a logical order, as shown in Figure 1, was taken as a reference.

In the execution stage of the bibliometric analysis and report of findings presented in Figure 1, the VOSviewer tool was used to report the co-occurrence, bibliographic coupling, and citation maps. Although there are other computer programs to carry out this type of analysis, VOSviewer focuses on graphical representation, which helps to easily evaluate and interpret the bibliometric maps (Herrera-Franco et al. 2020). In this way, it is possible to carry out data analysis (Donthu et al. 2021) without implying that it is a technically deficient tool. This tool usually produces better results when dealing with medium to large datasets (van Eck and Waltman 2010; Kirby 2023). The metadata analyzed in this study are mainly the references cited in the documents that make up the sample. Based on these data, bibliographic linkage and citation networks were prepared in VOSviewer. To complement the results provided by this software, the Bibliometrix library in the R (version 1.6.19) statistical package was used, which includes some useful applications for identifying trends, such as thematic maps and the analysis of production over time.
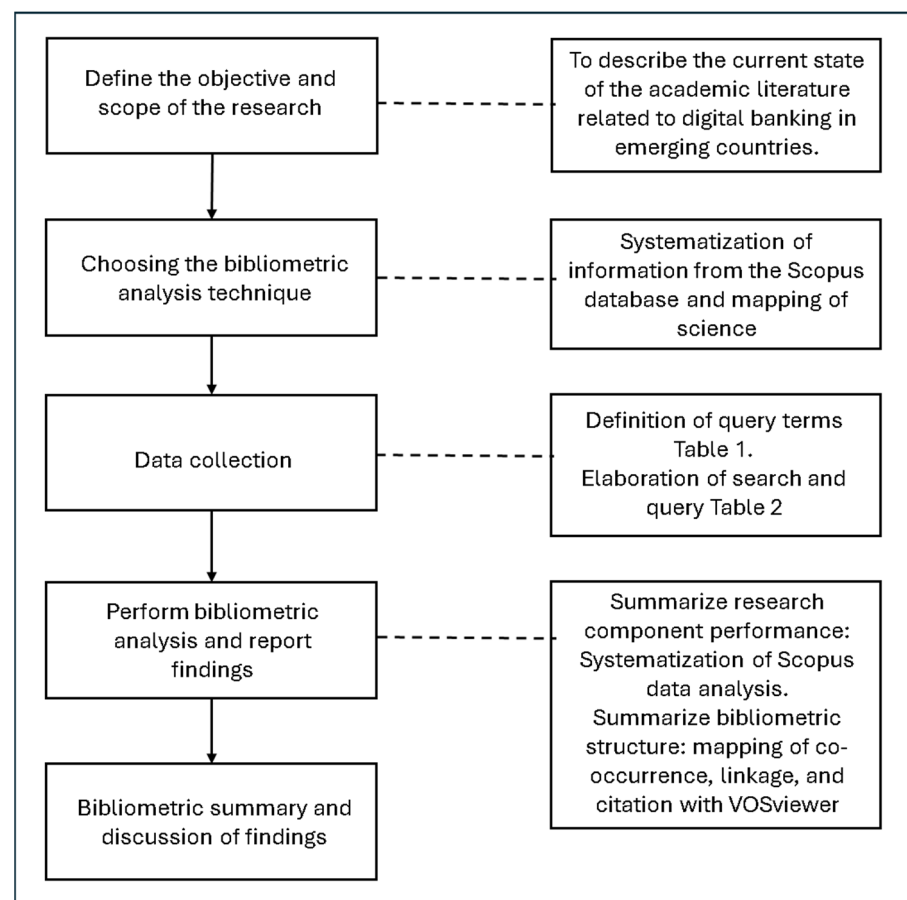
Figure 1. Bibliometric analysis protocol. *Note*: Based on (Donthu et al. 2021).

4. Results

First, an analysis of the publications generated annually was carried out, as shown in Figure 2. This analysis made it possible to show the attention that the academic community pays to a certain domain of knowledge. In this way, it is possible to identify temporal trends and periods in which an increase or decrease in the number of publications is evident. In addition, this analysis can help to determine the periods in which a given research topic has received more attention from researchers.

As with other types of firms, banks face the threats of ever-changing technological disruption. To counter these threats, digitization of banking services has become indispensable. This can be evidenced by the academic productivity in digital banking in 2020–2023, setting a growth trend in related research. According to Figure 2, the field of digital banking research and its adoption has received increased attention from the academic community.

At least four thematic clusters can be identified in the literature reviewed: information and communication technologies, trade and consumption, banking and finance, and economics and development. Figure 2 also shows an accelerated increase in publications on electronic commerce and consumption and banking and finance. This can be explained by the development of new mobile technologies, which were consolidated in the first two decades of this century. New operating systems such as Android and iOS have boosted the development and adoption of mobile applications (Adlatina 2011) as they offer the possibility of accessing advanced functions such as intuitive interfaces and integration capabilities.
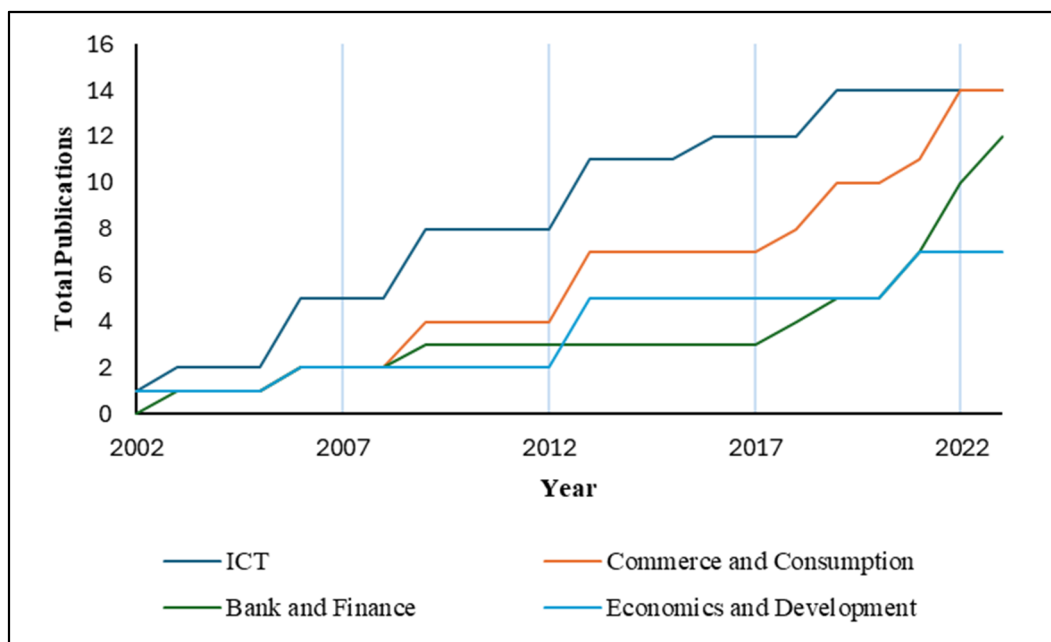
Figure 2. Analysis of thematic trends. *Note*: Based on data from Scopus, prepared with Bibliometrix software (version 4.3.0) and edited in Microsoft Excel.

Since 2017, there has been an increase in the number of publications on banking and finance, which can be explained by a consolidation of the structure of digital payment systems, an increase in venture capital investments to finance these solutions, and the development of new technologies in the financial industry such as cryptocurrencies and smart contracts. (Crame and Bodie 1996) already anticipated that new information technologies would bring about lower processing costs, a reduction in geographical boundaries, and the application of government regulations that would affect competition in the financial industry.

This dynamic represents serious challenges for traditional banking and has contributed to the emergence of new problems that have encouraged the development of studies related to cybersecurity and the regulation of financial technology. Another issue that is the subject of analysis in recent research has to do with financial inclusion and the impact that these technologies have on the problems inherent in emerging countries. This contrasts with older studies, which were focused on addressing problems such as the adoption of these technologies, which were studied for their potential capacity (Barnes and Corbitt 2003).

Figure 2 does not show the prevalence and trend of papers published between 1992 and 2001 because only two papers associated with that period were retrieved. The first, published by (Martinsons 1992), is a case study of an electronic banking system called HEXAGON, which was developed by the Hongkong Bank. The adoption of this technology enabled the bank to reduce costs, improve the quality of customer service, facilitate access to the bank's services, and position itself in the global market. Secondly, (Polatoglu and Ekin 2001) anticipated a fact that is particularly relevant today, namely that a bank without an advanced technological infrastructure could see its market share compromised vis-à-vis other banks and non-bank competitors (fintech).

To contextualize the object of study, an analysis was performed considering the thematic areas in which a greater number of publications have been produced. In this way, active areas of research, emerging trends, and disciplines from which the problem is addressed can be identified. In addition, this information can be useful for identifying emerging fields of research that deepen and broaden the perspectives that enrich the object of study.

Figure 3 shows the main areas of research in terms of the number of publications related to the object of study. The areas where publications are most prevalent are Business,

Management, and Accounting, followed by Economics, Econometrics, and Finance in second position. These two areas represent 57% of the total number of publications. Other areas that stand out are Computer Science and Social Sciences. This analysis indicates that the most relevant areas in this field are related to business and economics. However, there are a significant number of publications in journals related to information technologies and social sciences.
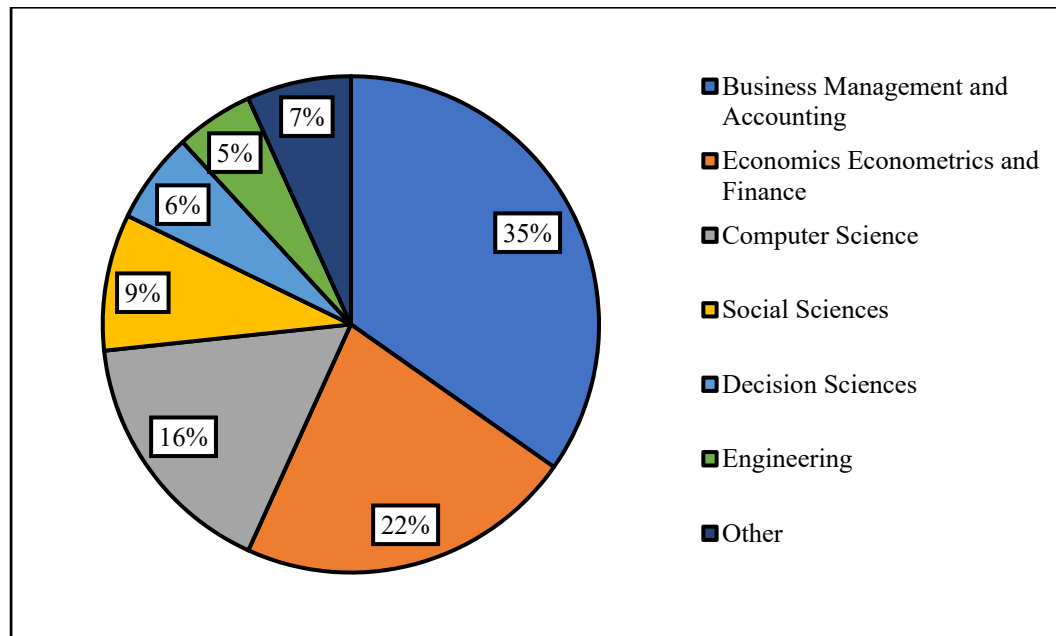

Figure 3. Thematic areas. *Note*: Based on data from Scopus.

Another relevant factor for evaluating the potential for generating international collaboration networks is the origin of publications. Identifying the regions or countries in which scientific content is produced helps to detect geographic trends in scientific production and the geographic centers that are leading the generation of new knowledge. Some studies show that there are factors that differentiate productivity between countries, such as the use of cutting-edge technologies to conduct studies and differences in affinity concerning thematic areas. Figure 4 presents a characterization of the level of academic productivity in different countries worldwide. India is a country with a significant prevalence of academic papers.

The construction of research networks is a factor that affects the level of productivity and the quality of research products. (Uwizeye et al. 2022) found that improved networks and collaborations contribute to creating a research environment conducive to increasing researcher productivity. In this sense, identifying the authors who generate the greatest contributions to the knowledge domain can enhance the impact of publications as this information makes it easier for researchers to identify potential collaborators or experts in a field, from whom they can obtain relevant information on the research problems addressed. This encourages the exchange of ideas and facilitates the construction of knowledge based on the main contributions of research.
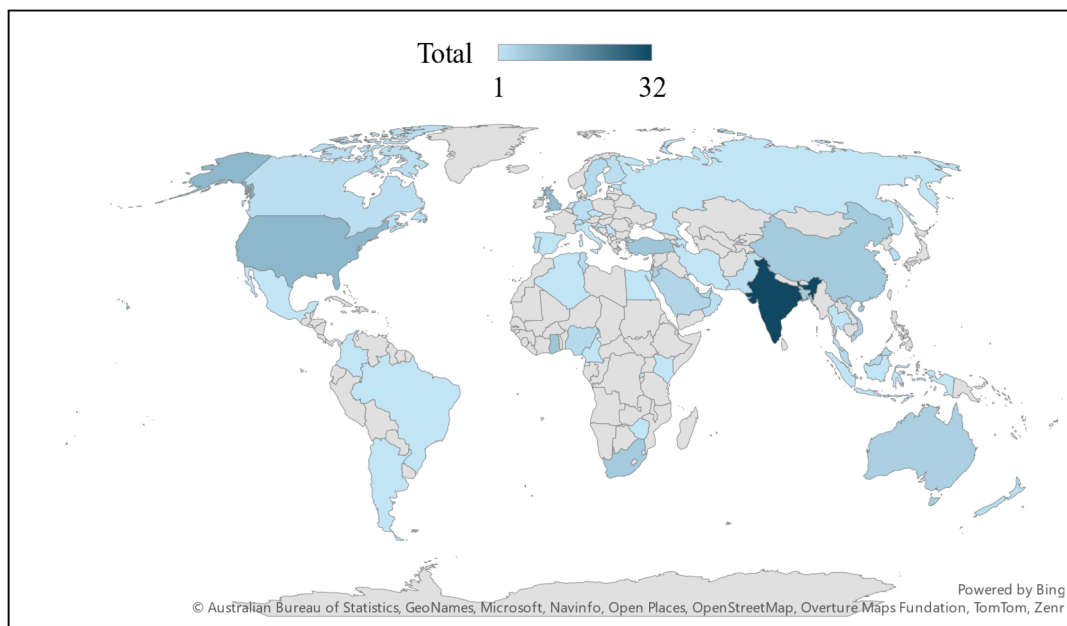
Figure 4. Productivity by region. *Note*: A choropleth map was prepared in Microsoft Excel based on data from Scopus to differentiate the countries with the highest level of productivity. Higher intensity of the blue color indicates higher productivity.

Table 3 presents the top five authors in terms of academic production in the field and the impact of the publications. The h-index measures influence, which quantifies bibliometric productivity based on the authors' publication history. It is measured based on the distribution of citations received by a researcher's total number of publications. The results show that a significant number of contributions have come from authors located in Tunisia and Sweden. This result shows that authors from advanced economies, such as Sweden, also show a growing interest in analyzing the phenomenon of digital banking adoption in emerging economies. According to the h-index, the author with the highest impact is Aymen Ben Rejeb, who has generated three publications related to this domain in emerging countries.

Table 3. Productivity and impact by authors.

Author Name	Country	Number of Publications	H-Index
Aymen Ben Rejeb	Tunisia	3	9
Daniel Nilsson	Sweden	3	4
Adel Boughrara	Tunisia	2	7
Kent Eriksson	Sweden	2	20
Ankan Shahriar Islam	Bangladesh	2	1

The frequency of keywords provides information on the main topics covered in publications, which allows researchers to understand the focus of the studies. In addition, this analysis allows the discovery of connections and relationships between concepts, topics, and fields of study, which contributes to identifying critical points and research trends (Liu and Prajapati 2022).

As shown in Figure 5, some clusters of emerging themes in the academic literature were identified using a network graph based on a thematic map. For its construction, Keywords Plus were considered, which are words that are not directly selected by the authors but are automatically generated from the titles and references cited in each article. The Bibliometrix Leiden clustering algorithm was used. The literature provides evidence that this algorithm produces better connected clusters, in contrast with the Louvain algorithm, which is used in extension; see (Traag et al. 2019).
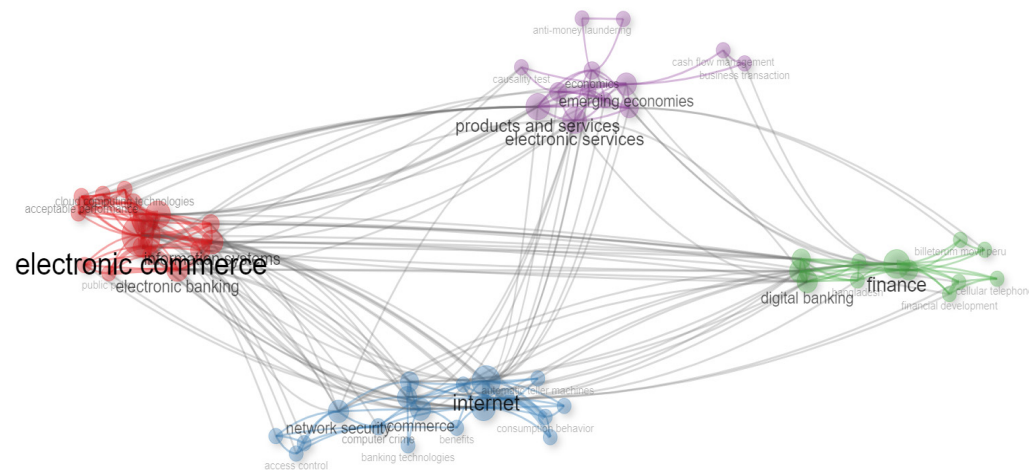
Figure 5. Thematic map. *Note*: Based on Scopus data and prepared with Bibliometrix.

The results of this analysis confirmed the four clusters reported in the thematic trend analysis in Figure 1. In short, the following thematic clusters are identified in Figure 5:

1. E-commerce: Connects issues such as electronic banking, cloud computing, information systems, and performance.
2. Internet: Addresses issues such as network security, access control, ATMs, banking technologies, and criminal computing.
3. Finance: Includes aspects such as digital banking, financial development, cellular telephony, and mobile wallets.
4. Emerging Economies: Considers issues related to the economy, products and services, electronic services, and anti-money laundering.

Although specific themes can be identified in the conceptual framework of the literature reviewed, there are strong linkages that make the categories overlap. For example, cash flow management and business transactions belong to the emerging economies cluster, but they have a direct connection to the finance cluster. Electronic products and services are linked to the Internet and e-commerce. Network security has a direct link to e-commerce. In this sense, despite the algorithm's effort to separate the contents into thematic clusters, there is an underlying construct that brings these dimensions together, which is related to the digitization of banking services in the context of technological innovation.

This analysis makes it possible to describe the mutual relationships in a citation network. According to (Rousseau et al. 2018), bibliographic coupling depends on the number of items that the reference lists of the documents under analysis have in common; therefore, the strength of this relationship is determined by the intersection elements in these lists. Figure 6 shows the collaboration networks between the main countries. The first group identified was India, the United States, Turkey, and Jordan. Another group of countries with important links around this research topic was also observed, including the United Kingdom, South Africa, Ghana, China, Australia, Vietnam, and Bangladesh.

Recurrent citation analysis indicates the impact or popularity of a given study. By elaborating a citation network, a graph is obtained where the nodes represent the individual publications, and the edges are the relationships between them. Closely related publications can be grouped into clusters, as shown in Figure 7, from which important topics can be identified (Nguyen et al. 2019).

Some aspects should be considered when interpreting the results of a citation analysis (Nguyen et al. 2019). For example, it is advisable to identify the year of publication since older publications are more regularly cited. On the other hand, some research topics may be more popular than others, which favors their citation to the detriment of other topics that could be related to emerging fields.
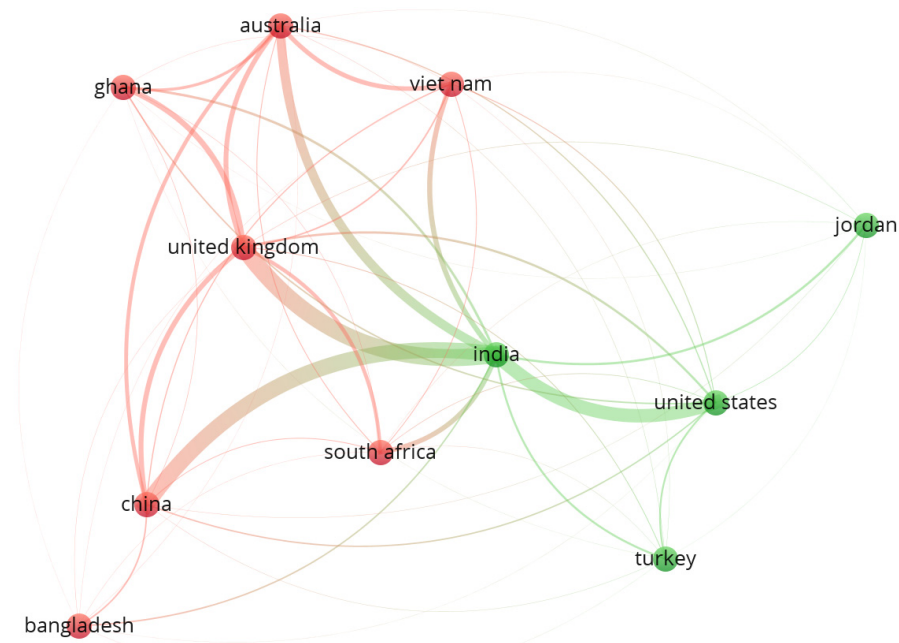
Figure 6. Bibliographic linkage map. *Note*: Based on Scopus data and elaborated with VOSviewer.
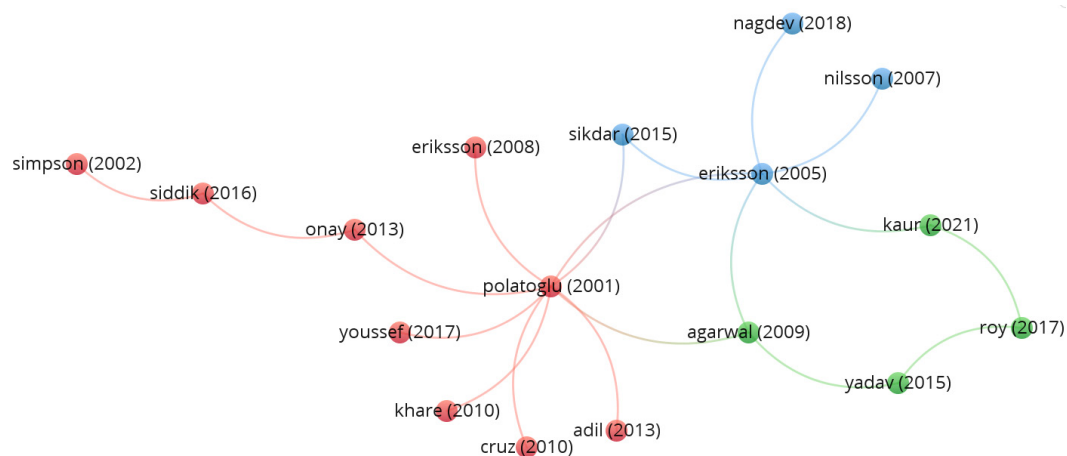

Figure 7. Map of documents citation. *Note*: Based on Scopus data and elaborated with VOSviewer (Polatoglu and Ekin 2001; Simpson 2002; Eriksson et al. 2005, 2008; Nilsson 2007; Agarwal et al. 2009; Cruz et al. 2010; Khare et al. 2010; Adil 2013; Onay and Ozsoz 2013; Yadav et al. 2015; Sikdar and Makkad 2015; Siddik et al. 2016; Youssef et al. 2017; Roy et al. 2017; Nagved and Rajesh 2018; Kaur et al. 2021).

Figure 7 shows the citation map of documents, where three groups of authors with a citation relationship between research studies can be observed. (Polatoglu and Ekin 2001) stand out for their level of centrality in the network. They conducted an exploratory study on consumer acceptance of online banking services. This study has become a benchmark for the development of subsequent publications related to the adoption of digital banking. In the green cluster, the study by (Agarwal et al. 2009) stands out, in which the determinants affecting customer perception, attitude, and satisfaction concerning online banking are analyzed. In the blue cluster is the work of (Eriksson et al. 2005), which addresses the technological acceptance of Internet banking in Estonia, an emerging economy in Eastern Europe.

Table 3 shows the authors with the most publications in this field. Among them, Daniel Nilsson and Kent Eriksson stand out and have developed some studies on the acceptance of digital banking and financial innovations in the context of developed countries such

as Sweden and Estonia. The authors can also be identified in Figure 7, where Eriksson's central position stands out. A surprising finding is that both authors reference the work of (Polatoglu and Ekin 2001), who analyzed the acceptance of Internet banking in the emerging economy of Turkey. This shows that studies contextualized in emerging economies are also a reference for research carried out in developed economies; therefore, they contribute to local knowledge and enrich the international academic panorama.

Ben Rejeb and Boughrara, on the other hand, developed their studies in the context of emerging economies. These authors are not identified in Figure 7, which shows that, despite having generated contributions in the field of research, their studies do not yet occupy a central place in the citation network. Although these studies address the problems of emerging economies, their focus is oriented toward the role played by stock markets. This explains their absence in the network in Figure 7, since this identifies studies that closely relate to technological adoption and innovation in the banking sector. For his part, the works of Shahriar Islam address specific issues related to banking technologies such as smartphone applications, electronic banking, and cybersecurity problems in the context of Bangladesh. Although the author deals with issues related to the digitalization of banking and the problems of emerging countries, his work focuses on characterizing these technologies and their functionalities, rather than on identifying the factors that influence their adoption.

5. Discussion

The results show an increase in the number of publications related to digital banking in emerging countries. Particularly noteworthy are the studies that approach this topic of research from the perspective of technological adoption. This is explained by the fact that even though electronic banking offers multiple benefits, experience has shown that its adoption rate is very low in developing countries compared to advanced economies (Demirguc-Kunt et al. 2021; Guerra-Leal et al. 2023). However, online banking has experienced an increase in popularity as it provides customers with a quick and easy transactional avenue (Abdou 2023). In this regard, online banking may favor the development of new business models in the industry, which may produce improvements in terms of operational efficiency as well as competitive pressures on banks operating under the traditional model.

As mentioned in the objective of this study, trends in the literature on the adoption of digital banking in emerging economies have been examined. The results allow us to divide the body of academic literature into four categories. The first, commerce and consumption, studies the factors that influence the acceptance of these technologies and allow us to understand the risks associated with their use. The second, information and communication technologies (ICT), analyzes the problems related to ICT such as security networks, authentication mechanisms, access control, and ATMs. The third, banking and finance, shows a broad group of studies that address specific services that banks and financial institutions can offer, such as mobile banking and digital wallets. The fourth is economics and development, which refers to financial inclusion, collaborative financing models, literacy, and the prevention of criminal activities, among others.

In this regard, there has been a significant increase in studies dealing with issues related to trade and consumption and the use of financial technologies, as illustrated in Figure 2. Most of these studies base their contributions on theories related to the intention to adopt technology, particularly on the basis of consumption. Another prevalent approach to theoretically support the results is the construct of perceived risk, which is related to the subjective assessment that a person can make about possible harms or drawbacks with the use of financial technologies (Yadav et al. 2015). Table 4 shows a characterization of the theoretical bases that support the 17 publications systematized in this bibliometric study, identified in Figure 7.

Table 4. Theoretical foundation.

Authors	Category	Theoretical Basis	Country
(Agarwal et al. 2009), (Eriksson et al. 2008), (Eriksson et al. 2005), (Kaur et al. 2021), (Sikdar and Makkad 2015), (Youssef et al. 2017), (Nagved and Rajesh 2018)	Technology Adoption	Innovation Adoption, Theory Technology Acceptance Model, Theory of Planned Behavior, The Unified Theory of Acceptance and Use of Technology (UTAUT), Expectation Confirmation Theory	India, Estonia Saudi Arabia
(Cruz et al. 2010), (Khare et al. 2010), (Adil 2013)	Perceived Quality	Customer Experience Management Relationship Marketing	Portugal and Spain, India
(Roy et al. 2017), (Yadav et al. 2015)	Perceived Risk	Technology Acceptance Model Theory of Planned Behavior	India
(Siddik et al. 2016), (Simpson 2002), (Onay and Ozsoz 2013)	Performance	e-Banking Concept	Bangladesh, Turkey, Emerging Economies
(Nilsson 2007), (Polatoglu and Ekin 2001)	Other	Cross-cultural Characteristics Innovation Adoption Theory	Sweden, Turkey

Note: The theoretical foundation that supports the 17 publications systematized in this bibliometric study is identified in Figure 7.

Technology adoption is a dimension widely discussed in the literature addressed in this analysis. There is evidence in the literature suggesting the perceived ability of technology to improve performance and reduce the effort required to adopt new technologies (Kaur et al. 2021). The perceived quality of Internet banking services is defined in terms of availability, information content, financial security, convenience, and personalization (Cruz et al. 2010). Some aspects considered are efficiency in the handling of accounts, the attitude of service personnel, frequency of errors, compliance with instructions, or data entry errors (Khare et al. 2010). Perceived risk influences customer trust, and this in turn affects the valuation of Internet banking for transactions (Roy et al. 2017). Other studies have found evidence of a positive relationship between e-banking adoption and performance measures such as accounting profitability (Siddik et al. 2016). However, the cost structure and risks play in favor of developed economies, as opposed to their emerging counterparts (Simpson 2002). Finally, there is another group of studies that address particular issues such as the demographic characteristics of e-banking users (Nilsson 2007) and factors affecting satisfaction such as reliability, security, and privacy (Polatoglu and Ekin 2001).

Table 4 confirms the central position of India, presented in Figures 4 and 6, concerning studies addressing the phenomenon of digital banking adoption in the context of emerging economies. According to (Agarwal et al. 2009), India offers great commercial opportunities for banks as a consequence of the economic liberalization policies adopted by the governments since 1990 and the increase in the flow of foreign direct investment. However, Indian banks need to understand that it is not enough to invest heavily in technology; it is important to get most customers to adopt it for electronic transactions (Kaur et al. 2021). (Nagved and Rajesh 2018) stated that the Indian banking industry has developed different Internet banking digital transformation initiatives that include features such as personalization, a broad view of customer relationships, and cross-channel integration. However, the perception of risk associated with Internet banking prevails among Indian users (Roy et al. 2017), so banking managers should strive to make a more robust and secure digital banking platform (Yadav et al. 2015). This phenomenon, observed in the Indian context, is also applicable to other emerging economy settings. Therefore, the studies conducted in this country provide a valuable benchmark for future research in other regions.

A striking fact that can be observed in Table 4 is that although the object of analysis of this study is focused on emerging countries, some papers identified in the co-authorship

network were developed in the context of developed economies. A review of these papers revealed some relevant findings. For example, the study by (Polatoglu and Ekin 2001), who analyzed the acceptance of Internet banking services in Turkey (an emerging economy), occupies a central position in the network and is cited in papers contextualized in developed countries. For example, (Eriksson et al. 2008) studied the acceptance of Internet banking technology in Estonia (Polatoglu and Ekin 2001), explaining that the perceived attributes of this technology are more important than the characteristics of the innovators in predicting adoption. (Cruz et al. 2010) analyzed the impact of perceived quality on satisfaction and enjoyment of these technologies in the European context (Portugal and Spain). These publications also refer to (Polatoglu and Ekin 2001) to support the idea that the typical Internet banking user is a relatively young man.

This bibliometric analysis has identified some studies that stand out in digital banking. For example, (Polatoglu and Ekin 2001) conducted a study where factors that may affect the adoption of an innovation or a product include complexity, perceived risk, and relative advantage. Organizational factors such as marketing efforts are also analyzed. In turn, (Agarwal et al. 2009) studied the factors determining user satisfaction in digital banking. It was observed that security and trust are factors that affect their level of satisfaction. Other studies suggest that a well-designed and user-friendly Internet bank cannot be used if it is not perceived as useful (Eriksson et al. 2005). Therefore, the perceived usefulness of Internet banking is a key factor in promoting customer usage.

Meanwhile, (Guerra-Leal et al. 2023) addressed the benefits in terms of financial inclusion that can be achieved through digital banking. The findings showed that the adoption of products such as an online bank account can be influenced by gender. Women were found to be more excluded than men, demonstrating a gender gap in access to digital banking accounts. Region is another factor that may have an impact on the adoption of digital banking; in more developed regions, the population uses a wide variety of digital banking services. The dimensions of technology adoption also affect the adoption of digital banking, as demonstrated in (Bellahcene and Latreche 2023). This study showed that perceived ease of use and perceived usefulness affect digital banking adoption in Algeria.

The findings of some studies show that digital banking is a key factor in boosting financial inclusion in emerging countries. However, efforts are needed to bring these technological benefits to regions with less access to Internet infrastructure. In addition, governments need to adopt policies that facilitate access to digital banking for populations that have traditionally been excluded from the system. For their part, banks face the challenge of developing solutions that better meet the expectations of their users. In that sense, the technology itself is not the added value of the digital banking model. The value depends on how these platforms facilitate and address key customer needs. Trust and security are essential factors from the users' perspective; therefore, it is imperative to adopt systems that safeguard financial consumer information and ensure the integrity of transactions made over the Internet.

In general terms, the bibliometric data show that digital banking in emerging countries is a growing field of research which has been encouraged by the introduction of new information technologies such as artificial intelligence, big data, and cloud computing. Although the most prevalent subject area is business and economics, there are studies related to the fields of computer science and social sciences. The bibliometric data show considerable contributions from emerging economies, where India stands out. Some of the research topics developed in this country relate to user satisfaction and perceived quality of use. For example, (Agarwal et al. 2009) showed that responsiveness is a key predictor of customer satisfaction. Other important contributions have come from countries in Asia, as is the case of (Khattak et al. 2023), who observed that diversification of the banking business improves profitability. In this context, financial technologies can be considered as a great opportunity for diversification.

6. Conclusions

This study conducted a bibliometric analysis of the development of digital banking in emerging economies. A conceptual framework related to digital banking has been presented and a bibliometric data collection strategy has been proposed. The publications included in the sample correspond to academic documents obtained from the Scopus database, for which a search equation was applied that included terms related to digital banking and emerging countries, allowing to obtain 118 publications. The results show a significant growth in this field of study, mainly during the last few years in which it can be observed that the adoption of technologies related to data analysis and automation has generated significant contributions in the banking industry. There are a significant number of publications that address the subject from the perspective of technological adoption. The findings of these studies point to critical factors that favor the adoption of technologies by financial consumers, particularly the trust and security of transactional channels and the ease and timeliness of these solutions.

The results reveal four trendsetting categories in this field of knowledge. The first is commerce and consumption, considering problematic issues such as quality and perceived risk (Adil 2013; Cruz et al. 2010; Khare et al. 2010; Roy et al. 2017; Yadav et al. 2015). The second, ICT, focuses on the provision of specific financial services, such as mobile banking, electronic payments, and digital wallets (Agarwal et al. 2009; Eriksson et al. 2005; Eriksson et al. 2008; Kaur et al. 2021; Youssef et al. 2017). The third, banking and finance, is related to the benefits and challenges of digital technologies, such as network security, criminal activities, and access control (Nagved and Rajesh 2018; Onay and Ozsoz 2013; Simpson 2002; Siddik et al. 2016). The fourth, economics and development, analyzes the impact of digital banking on economic and social development in emerging economies (Nilsson 2007; Polatoglu and Ekin 2001; Sikdar and Makkad 2015). Although nuances can be found in these clusters, some elements tend to cut across many studies, such as challenges related to technological adoption and innovation diffusion. An important compendium of papers focuses on issues related to consumption, while others focus their analysis on the performance of banks and the impact of these technologies on society.

These findings suggest that marketers may find an opportunity in this field of knowledge since digital banking technologies favor the processes of personalization of the bank's offered value and customer communication. Similarly, bank managers may find opportunities to develop a competitive advantage supported by digital technologies perceived as valuable to the target market. The development of the digital banking ecosystem also represents an opportunity for technology developers, as there is an increasing demand for mobile applications, online platforms, data analysis tools, and security systems aimed at providing a better customer experience. Finally, public policymakers and those in charge of developing social programs can study these technologies to help with the implementation of projects related to financial inclusion programs and the development of a solid regulatory framework that prevents fraud, inhibits criminal activities, and protects data privacy.

In this study, the prominent role of India in this field of knowledge became evident. A significant compendium of academic literature originating in this country was observed. These publications constitute a reference to be considered by academics and professionals interested in this domain of knowledge. Geographic complexity and cultural diversity mean that a significant part of the population in India does not have access to financial products and services. Digital technologies play a key role in addressing this problem since they make it possible to bring the banking portfolio to the most remote regions of the country. These technologies are also a catalyst for economic growth in the country by facilitating electronic transactions, automating access to many banking services, and reducing banks' operational costs. However, these benefits are accompanied by challenges that need to be addressed, such as gaps in access to the Internet or electronic devices, lack of financial and digital education, and cybersecurity and data protection issues. These characteristics are present in other emerging economies, so it is worth having a reference

with the aim of developing comparative studies and adapting analysis models to the particular needs of the countries.

This study has some limitations. First, only research articles published in the Scopus database were considered. Other sources of information could be considered in subsequent studies to expand the sample size and, thus, the spectrum of bibliometric elements that allow for characterizing the domain. The information input to conduct this work comprised publications and visual representations of the bibliometric networks. However, today it is possible to take advantage of data analysis technologies to obtain information that can broaden the scope of bibliometric studies. For example, further studies could apply thematic analysis techniques or deepen the longitudinal analysis through a spectrograph of references. Some strategies for literature analysis can also contribute to understanding the results, such as systematic reviews or meta-analyses. Furthermore, there are clear opportunities to develop empirical work to analyze the degree of adoption of digital banking in emerging countries and the factors that promote it.

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