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Twenty Years of Mobile Banking Services Development and Sustainability: A Bibliometric Analysis Overview (2000–2020)

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Abstract: The current paper aims to analyze the keywords related to mobile banking (otherwise known as m-banking) issues by focusing on its development from 2000 to 2020, of which the first publication about this issue appeared in the Scopus database. This paper explored and analyzed 1206 research papers using the Scopus database. Bibliometric analysis and content analysis had been conducted through Excel and VOS viewer software to obtain the results. In addition, the findings of this paper reveal that the universal trends and increased production at a global level led to many changes, and the most rampant topic associated with m-banking in most periods is mobile telecommunication systems. By showcasing the creation of the key terms in m-banking, it was possible to identify significant changes in the development of the field's key terminologies. Therefore, it is important to follow up on the development in future decades, particularly how the recent universal occurrences have influenced the changes in m-banking use at a global level. Moreover, the present study makes a significant contribution to the literature by providing a framework for future research. The framework provides opportunities for researchers to explore the research streams in future research. Finally, the current paper is the first of its kind in its method of contribution, ad according to the research databases (Scopus, Google Scholar, etc.), no work was witnessed in the published literature covering m-banking in a detailed and comprehensive multi-period manner and in such an applied method. In addition, the current paper fills this gap by conducting a bibliometric analysis and content analysis.

Keywords: mobile banking; m-banking; literature review; a bibliometric analysis; VOS viewer

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1. Introduction

M-banking refers to the services provided by financial institutions or banks and is considered one of the most important strategic changes to occur in retail banking in more than a decade [1,2]. Changes in technological interfaces have made it possible for the financial industry to delight its customers with instant solutions to their problems through the use of self-service technologies [3–6]. The services provide customers with the convenience of remotely conducting financial transactions on mobile devices such as tablets and smartphones [7–9]. Contrary to internet banking, m-banking incorporates the use of an application that is developed and designed by the service provider. The shift to online transactions led to the evolution of financial institutions, especially banks, that need to meet the contemporary needs to conduct operations online [1]. The new venture is beneficial for the service providers, with an array of advantages, including expanding the scope of operations past international borders, penetrating new markets, increasing trust in customers, significantly reducing operational costs, broadening delivery options, and enhancing performance levels [10–12]. Customers enjoy a wide range of advantages from

m-banking, including personalized and customized services and increased convenience since m-banking saves time and money for the customer [13–19].

Among the most recent modes of service delivery that are now available in banks, m-banking provides customers with remote access to bank service with wireless connectivity on smartphones. The advancement has eased the process for customers to follow up on their transaction histories, check account balances, participate in stock trading, transfer funds, obtain stock quotes, pay bills, order insurance, and manage investment portfolios [20]. Even though m-banking technology is not a new concept in the market, financial institutions in developed and developing countries have recently begun offering these services to consumers. The usage of m-banking services has been fairly limited. There has been an unsatisfactory level of utilization of the B2C mobile business model since a significant proportion of the customers are not conversant with matters of mobile commerce [12,21–23].

This research paper provides an analysis of key terms in m-banking and provides a more profound understanding of the developments experienced from 2000 to 2020. The research did not find a similar publication while examining the literature on keyword analysis and its development through bibliometric analysis. Therefore, the application is particularly advantageous to researchers and theoreticians in the scientific field. The paper provides more profound knowledge of how perceptions have changed about m-banking incorporation in various decades or reporting periods and the use of m-banking in certain decades. The researcher acknowledges the importance of being conversant with changes in the field of m-banking. Simultaneously, this study's main target audience is members of the academic community and managers influential in decisions made regarding m-banking.

The research paper is made up of five sections. The introduction informs the reader of the focus and aim of the publication and the assurance of the article's authenticity. The theoretical background follows and provides substantive data concerning m-banking and a detailed overview of authors involved in the field, followed by the objectives of the research. Section three describes the methodology of the research and the data-gathering approach. Next, the researcher describes the results of the bibliometric analysis more profoundly, and finally, a summary of the set goal and the achievements of the results of the research.

2. Literature Review

Electronic banking (e-banking) is important to practitioners and foreign economists, such as [24,25], and others. The article by [26] provides an analysis of the developments in Ukraine's banking networks. The banking system in Ukraine is the perfect example of the distances reached in terms of progress in the current banking systems and internet banking by focusing on advantages and opportunities. An overview of Internet banking shows that are several unaddressed issues that require more interventions and development to ensure the best strategies for utilizing e-banking. The article does not, however, provide the disadvantages that come with utilizing remote banking services. Previous research [27] states that options that are considered to increase the competitiveness of commercial banks ought to be based on the capabilities of remote customer services.

In current times, client cooperation and bank services are capable within the «client-bank» system. Some banks provide access to an online version of the "client-bank" that conducts the exchange of information using the internet [25,28]. On the other hand, the approach has limitations and disadvantages such as the requirement of installation of specific software on the consumer's devices such as smartphones and computers. This is mandatory to facilitate encryption, the receipt of data, and the client interface. Therefore, it is safe to say that the system does not effectively address the «client-bank» issue of lack of user independence from the service provider's geographical location. The authors in [29,30] state that M-Banking is different from conventional e-banking services as it has better service, information, and system quality in comparison to kiosks, computers, and laptops. Among the most significant advantages is providing customers with more convenience to engage in banking transactions than going to banks physically [13], therefore

suggesting that M-Banking has revolutionized the use of banking services since users can connect at any given time and, at the same time, conduct trading transactions.

The technology has significantly reduced the financial costs incurred in conventional banking services. The international money transfer service Azimo stated that through the utilization of banking applications, United Kingdom users save at least seven billion pounds annually. This assists in efficient money switching, therefore evading overdraft charges [31]. British Telecommunications state that mobile-online banks such as Monzo empower their customers to have more financial control. The UK is considered at the front of Europe's FinTech scene including M-banking. As of June 2020, the UK was home to six of Europe's ten FinTech unicorns, that is, companies with a private market valuation of $1 billion or more [31]. According to [32], gaining a more profound understanding of the influential factors affecting the utilization of m-banking services is necessary at an individual and societal level since this knowledge could save significant amounts of money in charges. In more recent studies, [33] found that the products of financial technology including M-banking play an important role in reducing customer costs of banking services and enhancing quality.

As mentioned earlier, a new trend is on the rise whereby consumers are more adoptive of M-Banking making it a prime factor for shifting to banks that offer customers with M-Banking's services. Banks are now more than ever recognizing M-Banking as a significant competitive aspect that is advantageous at an international level. Most of the competitive brands have invested approximately $115 billion to foster the adoption of M-Banking options. Previous research [34–36] states that the aim is that technological advancement will lead to a significant increase in consumer satisfaction, therefore strengthening customer loyalty, which will avoid the loss of customers to competing banks.

Several studies, through quantitative and qualitative methods, have analyzed m-banking and the issues that have an impact on the adoption behavior of consumers. Though there are several research-based international journals across various disciplines on m-banking adoption, there still exists a vacuum in the literature review of m-banking adoption. A review of such information is important and is a milestone in the progress of the research field [37,38]. This will provide a chance for reflection and review of the counterintelligence from an electronic database of research that also utilizes diverse methods, samples, and theories. In the scenario whereby findings of isolated studies are contradictory to one another, this becomes an important aspect of consideration [29,39,40]. Consequently, this research aims to provide a more profound understanding to the reader of this banking technology by compiling a detailed review of the m-banking adoption.

M-banking can be traced back to the 19th century during the launch of the German company Paybox in collaboration with Deutsche Bank. It was launched and tested in European countries such as Spain, Germany, Austria, the United Kingdom, and Sweden. In the United States, M-Banking services first started in the 1990s [41]. Since that date, the change has taken off, and almost all types of banking services can now be performed through mobile applications [19,42–45]. Kenya was among the pacesetting countries in m-banking in 2007 after introducing m-banking services that were based on text messaging, M-PESA. At least 7 million people had registered for the service by 2012. The authors in [11] provide that the prime motivating factor for the fast acceptance and adoption of mobile services is due to their opportunity created to run applications to obtain services at any given location while participating in other activities.

In [46], the author investigated the various aspects that are influential to attitudes to online banking, focusing on Finland. The article paper aims to provide a deeper understanding of factors related to the attitudes that have a significant influence on m-banking and banking services offered online. An extensive survey was carried out in Finland in 2000 with approximately 1167 responses. The formation process of attitudes was studied through the utilization of a structural equation model. The study results are utilized to show practical and theoretical input to electronic retail banking. The findings provide a more profound understanding of consumer behavior in this industry.

Research suggests that the adoption of online banking services provides banks with the opportunity to reduce costs while simultaneously increasing profit levels and productivity. Research [18,26,34,47,48] shows that the adoption of internet banking enables banks to reduce operational experiences and simultaneously increase productivity and profitability. Internet banking and m-banking are different. Banks, however, are more inclined towards investing in m-banking than internet banking channels. Among the most significant differences between internet and m-banking is mobility. Internet banking enables banks and customers to always interact regardless of location or time to provide access to financial transaction details [13,49–55].

Using mobile banking to transfer money has changed the banking sector for the better in many countries in the last few decades, but the addition of cryptocurrencies into the mix may achieve even more through a further reduction in transaction costs [17,56]. For instance, Bitcoin—the first decentralized cryptocurrency—was originally created to serve as an electronic payment system. There are estimations that, in 2019, almost $4 billion of Bitcoin were exchanged through online payment processors [56].

This research specifically aims at finding notable changes in the development of key terms in the field of m-banking in the last two decades (in the period from 2000 to 2020). Specifically, the researchers aim to discover the breakthroughs in m-banking research during that period, the intensity of relevant research articles (number of publications), the keywords and terms used in the m-banking articles in three main time clusters, and demonstrate a thematic map of the main themes of m-banking research. In addition, the researchers aim to provide future research direction by providing potential research questions/problems based on the themes investigated.

3. Methodology

In order to achieve the research aims, the researchers employed the content analysis method, a bibliometric analysis. The study used VOS viewer software to perform the bibliometric analysis. Bibliometric analysis refers to a technique of quantitative analysis based on similarity among articles in the bibliographic database and has become increasingly popular [4,12]. The comprehensive methodology used for the present study is presented in Figure 1.

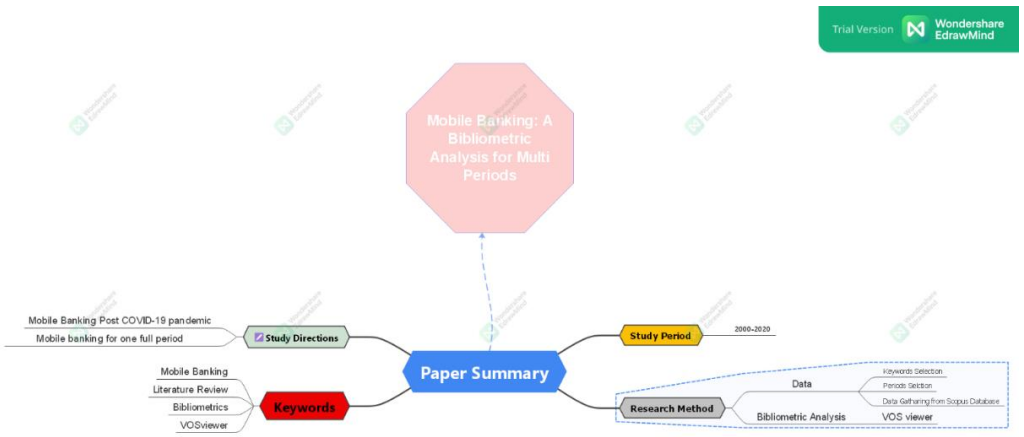

Figure 1. Summary of the paper steps, Source: Edraw Mind Software, Version 2.

The researcher chose m-banking because it is a highly debated and contemporary issue featured in the articles from the Scopus database. The research analyzed 1206 articles on m-banking. The method used in the study utilized analytical assessment of articles linking the context after synthesis, and statistical procedures used to determine the key terminologies concerned with the phenomenon of m-banking. The research also utilized the VOS viewer to provide graphical presentations of the results analyzed. The VOS viewer is a software tool available on the internet, which is used to create and visualize

bibliometric networks. It provides users with the capability of conducting an analysis of the key terminologies in various journals, as well as from various researchers, and the analysis of keywords on journals and various issues of individual publications and researchers. Viewers of VOS were categorized on the basis of co-citation, co-authoring relations, or bibliographic connection. Simultaneously, it conducts an evaluation of the data and has the capability to distinguish it visually and divide it into clusters; for example, it operates with data derived from the Web of Science and Scopus databases. Furthermore, it represents vital information with map assistance. Therefore, the paper aims to investigate the key terms utilized from 2000 to 2020. The analysis allows for the observation of perception changes that have occurred in matters of m-banking.

4. Conducting Research and Results

The term m-banking was first used by [57] as it appeared in the Scopus database. Since then, research into m-banking has made significant strides in this phenomenon. Table 1 provides a summary of the factors influencing the research development in m-banking.

Table 1. Breakthroughs in m-banking research.

Ref	Article Title	Summary
[58]	A mobile e-commerce solution	Wireless Application provides a platform for mobile banking, mobile shopping access is attained by data on the internet.
[49]	Issues in image utilization within mobile e-services	Utilization of images for accessible services from mobile devices will potentially become very rampant.
[59]	A location-dependent benchmark with mobility behavior	Main features of a location-dependent app contain more general queries targeted to the general mobile computing environment.
[60]	Mobile banking: concept and potential	This paper provides an explanation of strategic effects of m-banking and ends with a discussion of m-banking's future.
[61]	M-banking services in Japan: A strategic perspective	Describes the most significant Japanese banking practices and characteristics and ends with a discussion of m-banking's future
[62]	Technology-based services: a study on the drivers and inhibitors of mobile banking	Offers a description of a model that conceptualizes diverse factors in an electronic banking environment, especially mobile banking
[63]	Mobile banking as business strategy: Impact of mobile technologies on customer behavior and its implications for banks	An empirical survey of acceptance of consumers revealed significant growing interest in Mobile banking
[64]	Mobile banking in Germany: A strategic perspective	Investigates banking in Germany and ends with a discussion on the future of Germany's mobile banking
[65]	Mobile phone-enabled payment systems—Transformation 2008	Provides an overview of innovations and influences arising and the acceptance of m-payment products.
[66]	M-banking in developing markets: Competitive and regulatory implications	M-banking brings electronic transaction services and basic banking to unbanked consumers in developing markets.
[67]	Mobile banking: Proposition of an integrated adoption intention framework	offers a more profound understanding of variables influencing mobile banking adoption
[68]	An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust	The findings of the article show the advantages of compatibility, ease of utilization, and significant influences that lead to behavioral intention to adopt mobile banking
[69]	Examining mobile banking user adoption from the perspectives of trust and flow experience	Mobile service providers should be considerate of both trust and flow experience to encourage the adoption and use of mobile banking
[70]	Determining the relative importance of mobile banking quality factors	Results provide beneficial data to m-banking service providers for insightful information to m-banking services to improve efficiency
[71]	Mobile phone banking usage behavior: An Australian perspective	Results provide strategies to encourage online banking—and a cheaper channel for service delivery.
[72]	Factors affecting adoption of online banking: A meta-analytic structural equation modeling study	Provides ten factors affecting consumer adoption of online banking
[73]	Behavioral intention to adopt mobile banking among the millennial generation	Provides the prediction model that explains the variance in reasons to participate in online banking
[74]	Mobile banking services adoption in Pakistan: are there gender differences?	Findings show a positive impact on perceived control of behavior and attitudes towards adoption intentions of m banking

When analyzing articles dealing with m-banking, the researcher only refined materials from the Scopus database, and the only articles that were considered were those incorporating m-banking in the Keywords. To ensure the most relevant results are identified, non-related articles were filtered out until a total of 1206 articles remained. The picture shows a growing trend in publications of articles dealing with m-banking (Figure 2).

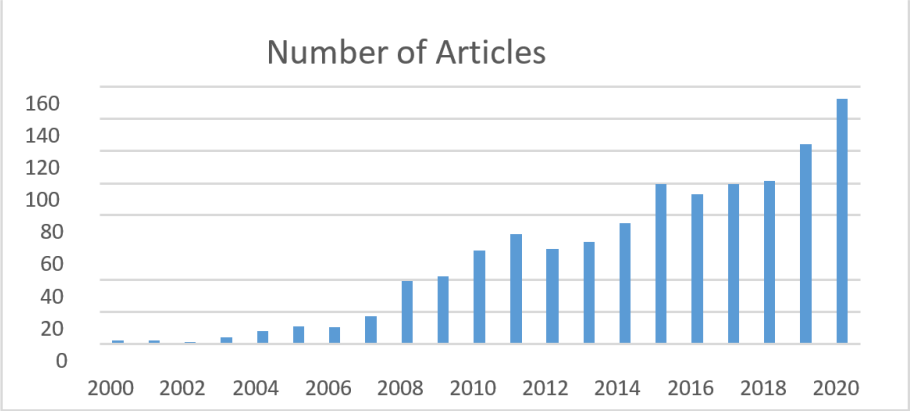

Figure 2. The number of publications on m-banking in Scopus database: own research.

The prime cause for the significant increase in publications in scientific databases is the technological development and the accompanying development in banking services, and changes in the evaluation criteria for academic personnel. Higher learning institutions such as universities and their staff are rated on the basis of the publications found in the scientific databases. Scopus is among the acknowledged databases.

The publications on m-banking were filtered to 1206 articles and sub-divided into three groups, based on their time frames. The major aim is to investigate how m-banking perceptions have changed. Therefore, the key terminologies in the articles were analyzed in the VOS viewer to gain an understanding of how their numbers and relationships have been altered.

The first group analyzed contained articles that were published between 2000 and 2006. At least thirteen key terms were utilized in the articles. Establishing the compulsory rule of a keyword being present in three articles caused a decrease to almost five key terminologies (Figure 3).

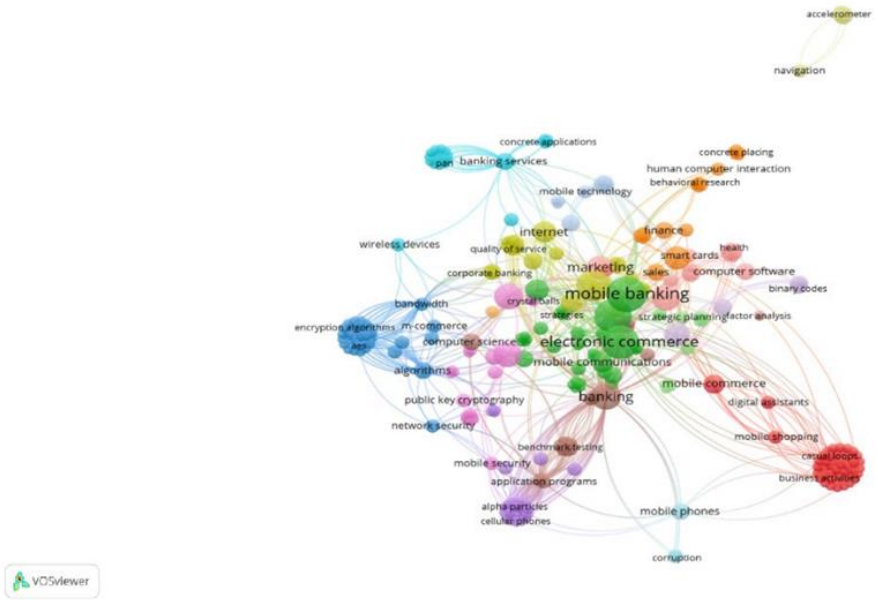

Figure 3. Keyword analysis for 2000–2006 Source: VOS viewer.

Electronic commerce was associated with the keyword m-banking. Therefore, m-banking was linked to mobile telecommunication systems and mobile computing over time. The second group analyzed had articles released from 2007 to 2013. The articles included 2196 keywords. Setting the keywords to appear in ten publications, 70 key terminologies were organized into one cluster (Figure 4).

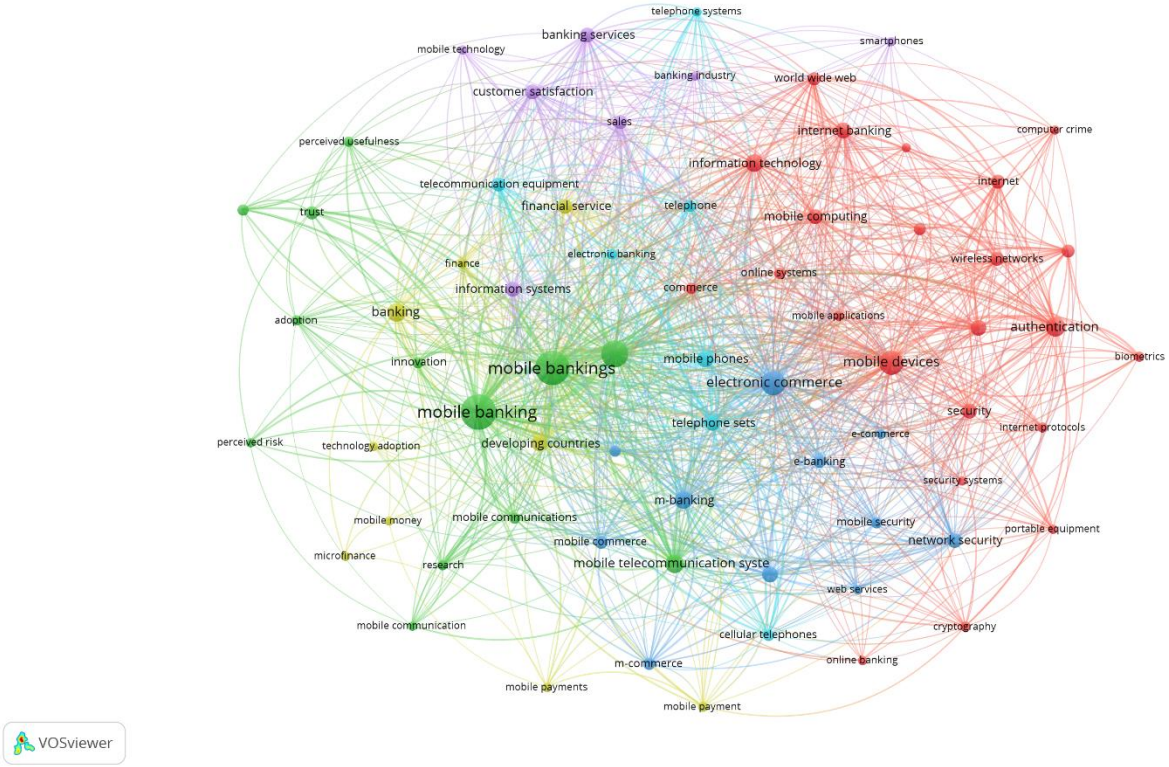

Figure 4. Bibliometric analysis for 2007–2013 Source: VOS viewer.

Compared to the previous period, some of the following keywords were added: Innovation, cellular telephone systems, mobile devices, electronic commerce, authentication, mobile phones, developing countries, telephone sets, internet banking, online banking, global system for mobile communications, information systems, network security, banking services, customer satisfaction, etc. M-banking was most often associated with innovation and cellular telephone systems. Within this time frame, a significant number of articles offered discussions on how to improve m-banking performance.

The third group of articles was published in 2014–2020, the last period for this study. Within this timeline, m-banking experienced a significant increase in the last two periods. m-banking caught the interest of more researchers, especially in the domain of economics, which began to address the phenomena during this time frame. In total, the research found 3532 keywords in m-banking publications from that period. The researcher utilized twenty publications to obtain the most applicable ones.

After choosing the publications, 52 prime key terminologies were identified (Figure 5). New keywords were added to the previous period: Android (operating system), electronic money, financial inclusion, financial institution, mobile applications, social networking (online), and others. The concepts of service adoption and the technology acceptance model were closely associated with m-banking.

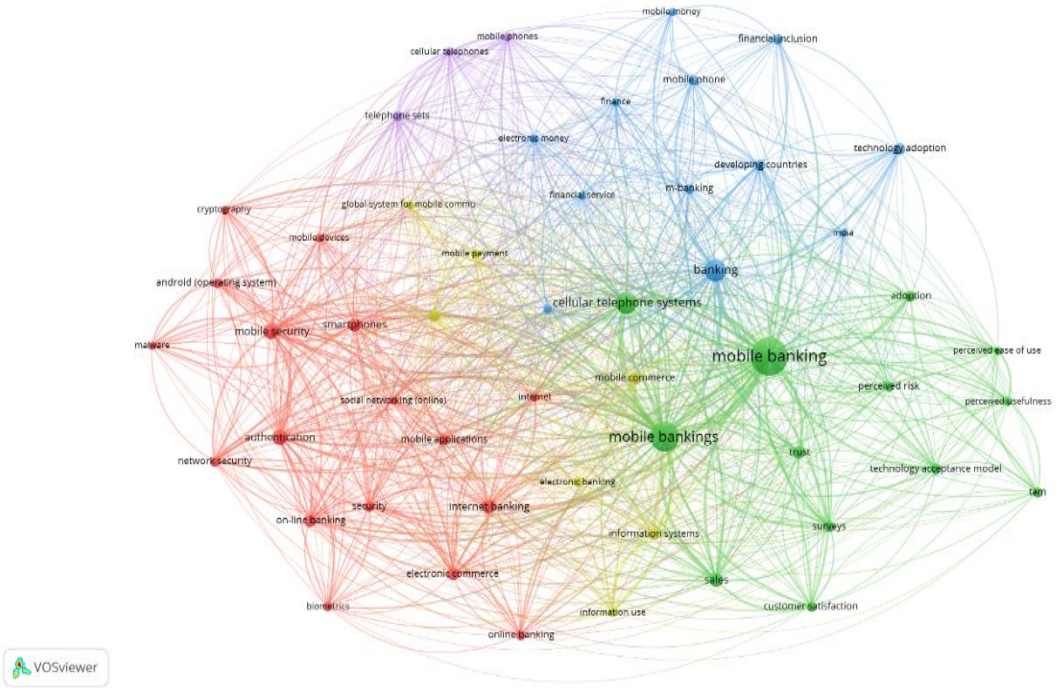

Figure 5. Bibliometric analysis for 2014–2020 Source: VOS viewer.

In addition, and in order to classify other themes, we used the thematic map function available in R-package to show themes according to their centrality and density. According to [75–78] (p. 150), there are four themes according to the quadrant in which they are placed:

(1) Upper-right quadrant themes: Those are the *motor-themes* of the specialty, which are *well developed and important* for the structuring of a research field, given that they present strong centrality and high density. These quadrant themes are related externally to concepts applicable to other themes that are conceptually closely related.
(2) Upper-left quadrant themes: Those themes are of marginal importance, very specialized, and peripheral in character, as they have *well-developed* internal ties but unimportant external ties (*isolated themes*).
(3) Lower-right quadrant themes: Those themes are *basic, general, transversal,* and important for a research field but are *not developed*.
(4) Lower-left quadrant themes: By having low density and low centrality, those themes are weakly developed and marginal, representing either *emerging or declining themes*.

As shown in Figure 6, the motor theme in mobile banking is security. Another theme that could be partially considered as motor, developed, and important is perceived risk. This indicates the importance of the technical aspects of m-banking in research as evident in the literature. Other marginal important themes (as shown in the top-left quadrant) are mobile banking in developing countries and mobile money. Surprisingly, the theme 'mobile banking apps' is found to be weakly developed and of an emerging or declining nature. This could be justified as the literature may lack studies about mobile-banking applications as it could be more relevant to practice and industry. Another justification is that this theme could be weakly developed but emerge in the near future.

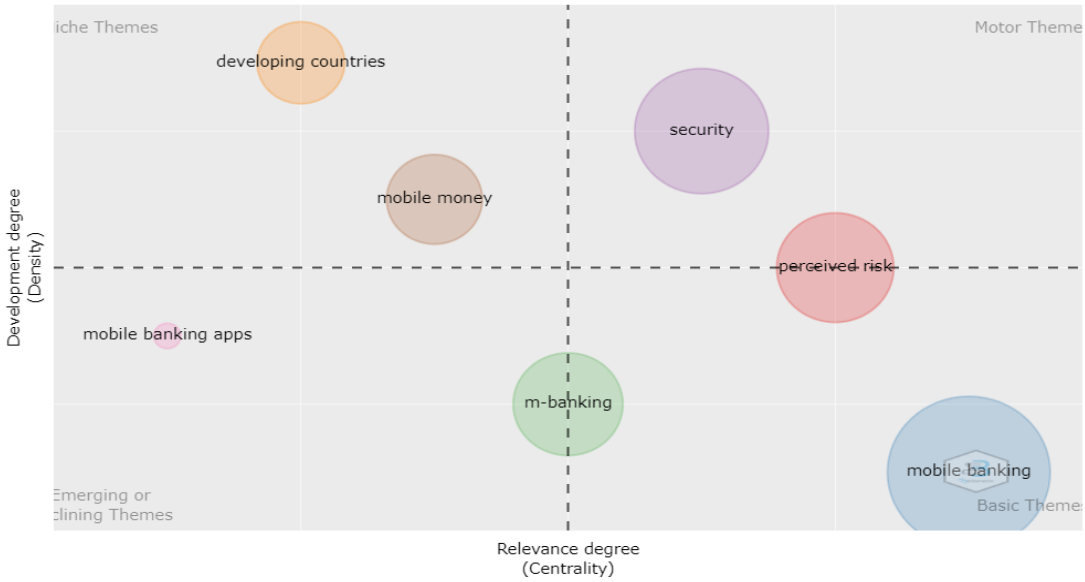

Figure 6. Thematic Map, Source: Rstudio.

Indeed, and during the years of COVID-19, the adoption of mobile banking has experienced higher rates but also faced different challenges. During this health pandemic, perceived security risks and privacy risks are considered the main themes in those recent years, as mentioned earlier, which indicates that they can, among the main drivers, impact users' intention to use mobile banking applications and services. This is hugely influenced by the lockdown procedures taken by the majority of the governments worldwide, which, in turn, forced more users to conduct financial and banking transactions from home to ensure health safety. However, those security and privacy risks are also considered challenges to the banks and the financial institutions, as they need to handle and manipulate them to ensure secure and private banking transactions, especially from the user's perspective [79]. This requires rigid countermeasures and procedures that protect the confidentiality and availability of clients' data, and secure it against attacks and penetrations.

5. Conclusions and Future Directions

The paper highlights that the perception and utilization of M-Banking have been altered during the reporting periods. The keywords associated with m-banking continue to be used extensively. Still, the primary selected word groups were not altered: Banking, cellular telephone systems, customer satisfaction, electronic commerce, Internet, mobile, telecommunication systems, and wireless telecommunication systems. Universal trends in economics, finance, and technology evaluations have had a significant influence on the perception of the m-Banking phenomenon, and therefore publications crafted on a global scope significantly increased.

The universal trends and increased production at a global level led to many changes. By showcasing the creation of the key terms in m-banking, it was possible to identify significant changes in the development of the field's key terminologies. Therefore, it is important to follow up on developments in future decades, particularly how the recent universal occurrences have influenced the changes in m-banking use at a global level. This can help M-Banking in understanding the worldwide trends in this field in different contexts, and set m-Banking benchmarks through research initiatives, which will lead to better customer experiences.

However, the significance of cellular telephone systems, customer satisfaction, electronic commerce, Internet, and mobile telecommunication systems are associated with Mobile Banking in each analyzed time interval. Locating the most utilized and analyzed terminology that is related to Mobile Banking contributes to the achievement of the paper's

purpose. Mobile banking is a fast-growing trend that needs to be analyzed in the context of the deep recession after the pandemic—to identify alterations in M-Banking application behavior in individual practices.

By analyzing this bibliometric study, it can be concluded that M-Banking is one of the interdisciplinary research fields that can investigate subjects from different fields and arenas. Moreover, future research may focus on Mobile banking for a full period, not as groups as was performed in this paper. Therefore, the researchers are proposing future research work based on the suggestions provided by the work-cited scholars and the authors of this research. Table 2 shows a future research agenda that targets trendy and researchable topics on M-Banking worldwide.

Table 2. Future research directions.

Research Theme and Domain	Potential Research Problems/Agenda	Source
MB security and privacy [technical aspects]	Developing a user-perceived mobile banking cyber security framework.	[80]
	Investigating up-to-date cryptomining, phishing, Trojans, and ransomwares in mobile banking and crypto currencies	Authors
	A framework for balance between big data gathering and privacy protection	[81]
MB in e-commerce and social media [commercial, cultural and social aspects]	examining the aspects related to the prevailing culture (e.g., Hofstede cultural dimensions) on mobile banking transitions	[82]
	how co-creation over social media influences attitudinal and behavioral loyalty in MB	[83]
MB users' attitude and behavior [Behavioral and adoption aspects]	What factors influence users' acceptance and usage of mobile banking applications? Extending TAM, UTAUT, qualitative studies, longitudinal study	[84]
	Client trust in mobile banking	Authors
	User Attitudes towards mobile banking options, functions and features, in terms of intention to use and actual usage in developing countries	[85–87]
MB wallets and payments [Financial and economic aspects]	The impact of economic and psychological switching costs of mobile banking services for consumers.	[88]
	The impact of anti-corruption architecture system and international business laws on mobile payments and mobile wallets.	[89]

6. Research Implications

Theoretically, the study is representative of the moderate- and high-quality papers published in the M-Banking field, and thus, this article can be further used as a theoretical basis for the investigation of new themes, relationships, and structures in this research field, such as the impact of AI and the social shifts on disrupting the future of M-Banking, and the need for a transformational platform to make the fintech revolution work by embracing theoretical models and frameworks. In addition, this bibliometric study makes it possible to explore M-Banking themes based on their external and internal ties, importance, and emergence, and accordingly, to better understand the development and perception of

M-Banking over time and is a leading guide for further studies in the field. In addition, this study can help researchers to focus on more emerging M-Banking themes and topics, which better contribute to the relevant literature.

Practically, this study can help M-Banking practitioners in understanding the worldwide trends in this field in different contexts, and set M-Banking benchmarks through their research initiatives driven by their Research and Development (R&D) departments to lead the m-banking practices and improve customers' experiences of M-Banking solutions. For instance, M-Banking smartphone applications constitute one theme shown in this research to be evolving and yet comprehensively addressed, which sheds light on this theme for more intensive research and from different internal and external ties, such as mobile application data analytics, exploring hidden patterns and relationships in M-Banking smartphone adoption from individual, social, financial, cultural, and economic perspectives. Furthermore, this study can imply an invitation to the field practitioners to contribute more technical research with a higher impact on the industry, such as more real case studies and practical research, which, in turn, can help in improving M-banking strategies and providing banking solutions to clients.

This research has a few limitations. Firstly, this study reviewed 1206 articles from only Scopus databases. This can limit the results of this bibliometric study as other articles in different databases were not accessed due to the lack of resources.

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