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Exploring the Synergy Between Financial Technologies and Financial Inclusion: What We Know and Where We Should Be Heading?

Vijayakumar Bharathi S¹, Arif Perdana^{2,*}, Mugdha Shailendra Kulkarni³

¹Symbiosis Centre for Information Technology, Symbiosis International (Deemed University), India, svkbharathi@scit.edu

^{2,*}Monash University, Indonesia, arif.perdana@monash.edu

³Symbiosis Centre for Information Technology, Symbiosis International (Deemed University), India, mugdha@scit.edu

Abstract

Background: Innovative financial technologies (fintech) are gradually changing how financial transactions and processes are conducted. The adoption of fintech not only benefits the financial sector but can also have a broader impact on society. Due to their ability to provide customized services to a wide range of stakeholders, fintech is gaining traction and experiencing significant growth. Compared to traditional financial institutions, fintech companies can reach a wider audience and operate more efficiently. In addition to upending traditional financial services, fintech can also provide financial services to marginalized groups. We argue that fintech research and practice should focus on seizing opportunities and addressing challenges related to financial inclusion, especially in emerging markets.

Method: We conducted a systematic literature review of 178 articles to understand the relationship between fintech and financial inclusion.

Results: Our analysis highlights six fintech research themes: fintech and financial inclusion, fintech adoption and use, fintech and sectoral growth, fintech and lending, and technology shaping the fintech. We also present four future themes (basic, driving, niche, and emerging or declining research) that can accelerate financial inclusion.

Conclusions: This study highlights the synergies between fintech and financial inclusion research. This study contributes to existing knowledge in three ways. First, the descriptive analysis maps existing research on fintech and financial inclusion. Second, the qualitative analysis provides a comprehensive overview of how fintech and financial inclusion topics is interconnected. Third, future research areas for fintech and financial inclusion were identified. In general, fintech democratizes financial inclusion for the unbanked and marginalized communities while reducing operating costs. Governments should promote financial inclusion among those most vulnerable and affected by global threats.

Keywords: Fintech, Financial Technology, Peer-to-Peer Lending, Systematic Literature Review, Financial Inclusion.

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Introduction

Financial technologies, or fintech, are essential in transforming banking and finance (Nejad, 2022; Seth, 2020). The financial industry is a fertile ground for exploring, testing, and adopting new technologies to improve customer experiences (Bandi & Kothari, 2022). Fintech innovations are gradually changing the existing way financial processes are managed. It can also benefit the financial sector and society (Gomber et al., 2018; Van Loo, 2018; Wonglimpiyarat, 2017). Additionally, it also enables automated capabilities, digitization of processes and workflows, paperless operations, and improved customer experiences by replacing the traditional financial ecosystem with technology- and software-based services that are interoperable and seamless (Kaur et al., 2021). Specifically, fintech involves using technologies (e.g., artificial intelligence/AI, machine learning, Blockchain, and the Internet of Things/IoTs) for various financial functions (Demirguc-Kunt et al., 2017; Gabor & Brooks, 2017; Luo et al., 2022; Tseng et al., 2021). These technologies enable fintech institutions to develop new and innovative business models.

Existing studies have identified the emerging field of fintech as a trendsetter disrupting the traditional financial ecosystem. Fintech is gaining momentum and experiencing significant growth by offering customized services to customers to a broader range of society and product leveraging agility in tracking, monitoring, analyzing customer touchpoints, and establishing follow-up strategies with customers (Galvin et al., 2018; Yazici, 2019). As a result, fintech companies should achieve industry-wide reach and operate more seamlessly than traditional banks. Several startups have emerged in response to the great enthusiasm that fintech has generated in transforming the financial services industry.

Fintech providers are revolutionizing financial services through various services such as mobile money, peer-to-peer (P2P) lending platforms (e.g., equity crowdfunding, crowdlending, and crowdfunding investment), automated credit scoring, international remittances, and digitalized customer reviews (Jutasompakorn, et al. 2022; Perdana et al., 2021a). The ease of use, speed of transactions, and cost-efficiency of fintech are some of the solid differentiators for their acceptance in the market (Leong et al., 2017). In addition to disrupting traditional financial services, fintech offers a remarkable opportunity to advance financial services and contribute to developing underserved and financially excluded communities.

The risks and challenges of financial exclusion must be considered in fintech research and practice, especially in developing countries (Duan et al., 2021; Senyo et al., 2022). These economies suffer from financial exclusion due to inadequate financial knowledge and skills, high operating costs, and an underdeveloped demographic profile (Klapper & Lusardi, 2020). Several other factors contribute to financial exclusion, including regional and cultural barriers, psychological reasons, and reasons for self-exclusion (Caplan et al., 2021). Low access to financial products is a problem for low-income households (Ozili, 2018; Ozili, 2021a)

While fintech research is diverse, evidence on how fintech research can accelerate financial inclusion is lacking (Lagna & Ravishankar, 2022). This issue is critical in Asian countries, where financial inclusion should follow fintech acceleration. In Indonesia, for example, while many fintech startups are thriving, financial inclusion remains a critical issue as this fintech primarily targets urban populations rather than rural communities. There is also a lack of financial literacy in rural communities¹. In our observation, the link between fintech and financial inclusion still needs to be explored in academia. For example, only three articles in the Pacific Asia Journal of the Association of Information Systems focused on fintech

¹<https://www.telkomsel.com/about-us/blogs/5-tantangan-inklusi-keuangan-di-indonesia>

(Alhammad et al., 2022; Perdana et al., 2021a; Shang & Chiu, 2022). However, these studies are silent on financial inclusion. Instead, the findings inform the reader about the crowdlending diffusion, payment system integration and user experience, and the impact of backer behaviour on reward crowdfunding projects. Moreover, many published papers we observed in academic journals have scattered explanations for the link between fintech and financial inclusion. We still need to improve our understanding of this vital area.

Therefore, this study aims to create a more comprehensive understanding between fintech and financial inclusion through a systematic and topical analysis. Our analysis provides a unique opportunity to identify research directions that may address some of the unaddressed and persistent financial inclusion challenges. We post the following research questions to guide our review: (1) *What is the geographic focus of research on fintech and financial inclusion from the prior study?* (2) *What linkages between countries and publication sources on research topics connecting fintech and financial inclusion?* (3) *Who are the authors that contribute most to the impact of fintech on financial inclusion?* (4) *What are the essential fintech and financial inclusion research topics?* (5) *How can fintech research promote and accelerate financial inclusion?*

We collected data from two well-known academic research databases, Scopus and Web of Science (WoS), to answer our research questions. We selected the two databases to demonstrate a comparative scope of research and suggest how future fintech and financial inclusion research should be directed (Baas et al., 2020; Mongeon & Paul-Hus, 2016; Zhu & Liu, 2020). This study contributes to the growing interest of academia and industry in exploiting the potential of fintech to accelerate financial inclusion. Our analysis provides valuable insights into the current trends, ongoing research, and prior literature through a systematic review.

The remainder of the article is organized as follows. Section 2 overviews the links between fintech, financial inclusion, inclusive finance, and microfinance institutions. Section 3 describes the inclusion and exclusion methods for selecting papers in the systematic review. We then explain the procedures for the systematic review according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (Moher, 2018; Moher et al., 2010; Page et al., 2021). Section 4 analyses the data by providing relevant descriptive statistics and clustering the research topics using thematic analysis. Section 5 proposes a framework to advance fintech research on financial inclusion. Section 6 provides a practical contribution, especially for Asian countries. Finally, we conclude this paper in Section 7.

Fintech, Financial Inclusion, Inclusive Finance and Microfinance Institutions

Access to financial products and services is a prerequisite for poverty eradication, and financial inclusion is one of the keys to successful finance-led growth strategies in many developing countries (Demirguc-Kunt, 2018; World Bank, 2020). Providing innovative solutions to access and affordability challenges can be critical in promoting financial inclusion (Daud & Ahmad, 2022). Mobile banking and digital payment systems make financial services accessible to remote or underserved communities (Museba et al., 2021). Platforms such as P2P lending can provide access to credit for small businesses and individuals (Perdana et al., 2021b). Low-income individuals and businesses can also benefit from fintech by lowering the cost of financial services. By lowering transaction costs and reducing barriers to entry, digital platforms streamline processes and reduce paperwork (Wang et al., 2021).

In addition to financial inclusion, the literature also mentions inclusive finance (Corrado & Corrado, 2017; Sun & You, 2023). Financial inclusion and inclusive finance are integral to promoting economic and social development, but they have slightly different approaches

(Corrado & Corrado, 2017; Hasan et al., 2021; Sun & Tang, 2022). Financial inclusion ensures access to financial services for everyone, while inclusive finance addresses the needs of various groups (Corrado & Corrado, 2017). Inclusive finance has gained prominence in research and practice as it endeavours to augment the last mile of financial services for people and micro, small & medium enterprises (MSMEs) (Financing for Sustainable Development, n.d). Inclusive finance is a vital concept that enables equal access and affordability of financial products for the economically weaker and marginalized population (Hasan et al., 2021). Inclusive finance empowers marginalized populations to access a broader portfolio of financial products and services (microcredit and investment plans), which strengthens the sustainable and inclusive economic growth trajectories of developing countries (Chen, 2016; Corrado & Corrado, 2017). Financial inclusion initiatives in developing countries leverage fintech applications to gain momentum and expand the reach of inclusive finance.

Inclusive finance is a term used to describe financial services such as microfinance, mobile banking, remittances, and insurance that target marginalized communities. These communities often need small loans for their businesses or daily needs, but they need help accessing credit or loans due to their exclusion from the formal financial system. To address this issue, Mhlanga (2022) suggests using low-cost digital technologies to serve financially excluded populations.

Microfinance institutions (MFIs) are a critical component of efforts to address financial exclusion (Wu et al., 2022). MFIs worldwide offer a range of microfinance products focusing on social goals, including microcredit and financial education for economically disadvantaged populations (Bongomin & Munene, 2019). However, the development of fintech startups has expanded the scope of financial inclusion beyond traditional microfinance products. For example, fintech startups offer products such as InsurTech, which combines insurance with IoT, artificial intelligence, and machine learning (e.g., Dacadoo, Etherisc, Ladder Life, Lemonade, Spot), RegTech, which includes regulatory compliance technologies (e.g., Continuity, IdentityMind, Provenir, Regis- TR, Regnology), robo-advisors that use algorithms to manage assets and investment portfolios (e.g., Betterment, Ellevest, Wealthsimple, Wealthfront), crowdlending (e.g., Capital Match, Crowdo, Funding Societies), and PayTech (e.g., Paytm, PhonePe, Youtrip).

Most microfinance institutions provide unsecured loans, meaning they are subject to a substantial risk of default, have low or non-existent profits, and require considerable time to underwrite and process a loan application (Uddin et al., 2022). Fintech offers an alternative to the existing MFIs customer with a more streamlined process through online P2P lending. A vital feature of this lending is the integration of traditional microfinance with advanced technologies. By disclosing borrower information, crowdlending enables direct interaction between borrowers and lenders, reducing transaction costs and improving financial inclusion (Wang et al., 2021). For example, Kiva is one of the pioneers in the fintech space that combines microfinance and fintech. Kiva offers two models of microfinance: referral-based and direct P2P. In developing countries, Kiva has collaborated with several MFIs to implement the first model. Monitoring of borrowers and enforcement of loan repayments are the responsibility of the partner MFIs. Kiva enables these MFIs to publicize their loans allowing potential investors can refinance them. In the second model, investors interact and communicate directly with US borrowers. In this case, the borrower's network must support the loan application to prove their creditworthiness.

Financial inclusion enables access to a wide range of financial products and services at a low cost (Demirguc-Kunt et al., 2017; Schuetz & Venkatesh, 2020). Consequently, fintech should be at the forefront of innovative topics that could help extend financial inclusion to third-world countries. Financial inclusion strengthens financial institutions by providing consumers with further access to the most economic institutions (Demirguc-Kunt et al., 2017; Lee & Shin, 2018). Fintech can contribute to financial inclusion by making transactions more efficient,

faster, and convenient (Geranio, 2017; Jameaba, 2020). Fintech allows the financial sector to reduce operating costs while ensuring that services are available 24/7 (Ahn & Cho, 2019). In addition, fintech enables more convenient services that make customers' lives easier (Bollaert et al., 2021). Chatbots, for example, provide a customized and cost-effective way to engage with customers (Trivedi, 2019). AI has eliminated the need for intermediaries and reduced operational costs (Bussmann et al., 2020). Complementary technologies such as blockchain-based platforms and AI can help the financial sector become more innovative, transparent, and secure. With the advent of digital wallets and electronic payments, from fiat money to cryptocurrencies, fintech applications are expanding (Alt et al., 2018; Gomber et al., 2018). Even in communities in remote areas, the increasing accessibility of cell phones enables e-payments in developing countries. E-payments, thus, could accelerate the cashless society initiative in several countries, increase transparency, and enable unbanked communities to better manage their cash flows.

Method

This study used a systematic literature review to answer the research questions in the Introduction section. Thus, the methodology included two primary dimensions: (i) the design and implementation of a systematic literature review (SLR) based on PRISMA 2020 guidelines and methodology (Page et al., 2021). We applied PRISMA 2020 to rigorously review documents by defining the inclusion and exclusion criteria. The following sections explain the step-by-step approach for the above dimensions.

Dimension One - Systematic Search Method

Data from Scopus and WoS formed the basis for systematic analysis using keywords and search queries related to the research topic (Bartol & Mackiewicz-Talarczyk, 2015). The research data available in these two databases can play a critical role in increasing the visibility of published scholarly work. These two databases index reputable academic journals and conference proceedings.

The main search terms are "Fintech" OR "Financial Technologies", OR "Financial Technology", AND "Financial Inclusion" (see, Tables A.1 & A.2 in Appendix A). Tables A.1 and A.2 contain the main search terms used to retrieve academic research results from the Scopus and Web of Science (WoS) academic databases. The first column of the tables indicates the number of iterations, the second column describes the search query, and the third column indicates the number of documents retrieved). Journal articles and conference papers published in English in Scopus and WoS were considered for data analysis. Data were retrieved as of April 11, 2022.

Tables 1 and 2 show Scopus and WoS's search terms and results. The TITLE-ABS-KEY (title, abstract, and keyword) form the basis for searching publications in academic databases. The next step was to download the data based on the WoS results (iteration 2) and Scopus (iteration 3), merge them into a single file, and remove duplicates. We used the R software tool v 4.1.3 and applied the following queries for the systematic search (see Table A.3 in Appendix A). Table A.3 lists the query strings used in the R software tool (v4.1.3) to (i) download the data files resulting from the third iteration in Scopus and the second iteration in WoS (as indicated in Table A.1 & A.2), (ii) merge them into a single file, and remove duplicates. In the following sections, we explain the methodology used for data collection.

Dimension Two - Systematic Literature Review (SLR) Planning using PRISMA

SLR serve many essential purposes in research. It provides summary insight into the current state of knowledge and future research directions, enables the development of relevant

research questions from the earlier literature that can be resolved in future studies, and facilitates the creation or investigation of theories about the 'how' and 'why' of an emergent phenomenon. SLR creates valuable knowledge for researchers, policymakers, practitioners, and educators (Moher, 2018; Moher et al., 2010). To ensure the value of an SLR to its stakeholders, authors must provide a transparent, complete, and concise note about the purpose, identification and selection of studies, characteristics of the studies involved, and findings. A robust guidance framework can make it easier for authors to add value (Moher et al., 2010).

The PRISMA, published in 2009, are guidelines for improving the structure and reporting of systematic reviews (Moher et al., 2009). However, since 2009, there have been several advances in systematic reviews, primarily due to advances in data science (natural language processing and machine learning) (O'Mara-Eves et al., 2015). Some examples include the development of new information technology tools to assess the review results, the development of new methods to evaluate the risk of bias in the existing studies' results, and the development of new methods to synthesize and present results when meta-analysis is not feasible or appropriate (Campbell et al., 2020; Whiting et al., 2016). In addition, the terminology used to explain a particular review process has also evolved from measuring "quality" to "certainty" (Hultcrantz et al., 2017). The publication landscape has also changed, and new ways have emerged to register and disseminate review protocols (Moher et al., 2012)

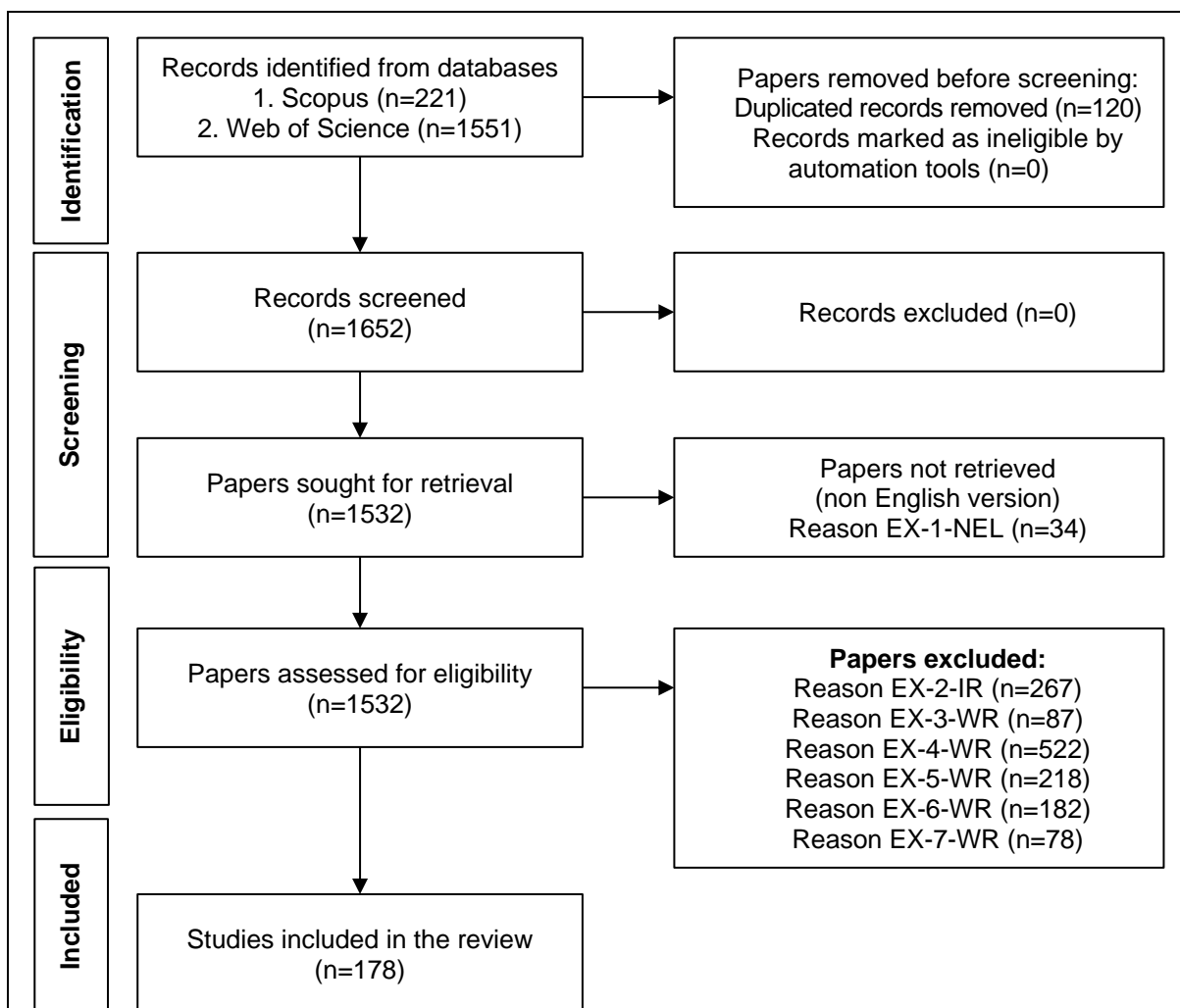


Figure 1 – The PRISMA Flow Chart Reporting the Various Phases of The Systematic Literature Review

The earlier 2009 PRISMA version was updated in 2020 to reflect the advances in the SLR ecosystem. The latest PRISMA version included a revised flowchart for original and updated reviews (Page et al., 2021). Recent studies using the latest version have found several advantages over the previous version, including improved adequacy, higher confidence in results, and greater robustness of results (Page et al., 2021). Therefore, we used the revised flowchart to identify, review, and include research documents in the current study. Figure 1 illustrates the various stages of this systematic fintech and financial inclusion research review. Table A.4 in Appendix A details the review principles that lead to the criteria for the inclusion and exclusion of study documents. Each paper's title, keywords, and abstract were reviewed to determine the study's relevance. All authors reviewed the full texts of all 178 included papers on a rotational basis to justify the selection. Therefore, these papers form the basis for the two dimensions of the analysis to answer the research questions.

Analysis

This section first presents an analysis of descriptive data on research articles on fintech and financial inclusion. This includes (a) the annual scholarly production of articles and the average total citation for each article in Table 1 (b) a three-field diagram showing research links among countries, keywords, and sources, (c) the primary source of publication, and (d) topical and thematic analysis.

Citation Analysis

Table 1 presents a steady increase in the annual growth of articles on fintech and financial inclusion. The average annual growth rate of articles was 61.88% from 2016 to 2022. We did not impose a time restriction during the identification stage of the PRISMA methodology. However, periodicity arose naturally in the screening and eligibility phases, which filtered out publications that combined fintech and financial inclusion. Therefore, in the inclusion phase, research publications dedicated to the synergies of fintech and financial inclusion appeared for the first time in 2016, while earlier publications focused on only one of the two concepts. Hence, the selection of publications ranging from 2016 to 2022. The average citation rate per article is a relevant metric to evaluate the average impact of an article.

Table 1 – Annual Growth of Articles and Mean Total Citation Per Article		
Year	Articles*	Mean Total Citations per Article**
2016	2	20.50
2017	6	52.00
2018	7	20.00
2019	18	8.22
2020	51	5.34
2021	58	1.50
2022	36	0.60
Total	178	

* Include early cite documents (until mid-April 2022); **Citations exclude early cites

The number of articles published increased from 2016 to 2022 (see, Table 1). In 2016, two articles were published on fintech and financial inclusion; in 2021, 58 were published; and by April 11, 2022, 36 were published. Many earlier articles cite the importance and relevance of fintech and financial inclusion research. From 2016 to 2022, the average number of citations per article was 20.50 (mean). Between 2017 and 2022, six articles in 2017 and seven in 2018 received an average of 52 citations. The average number of citations for 18 articles in 2019-2022 was 8.22. Between 2020 and 2021, publications increased to 51 and 58. In addition, the citations per article in 2020 and 2021 were 5.34 and 1.50, respectively.

Research Topic and Its Linkages with Countries and Publication Outlets

Based on the country of affiliation in Figure 2, the geographical distribution of the publications relating to fintech and financial inclusion. It is interesting to note the balanced mix of developing and developed countries contributing to research articles on fintech and financial inclusion. As a detailed analysis (frequency of occurrence) of the top three contributing countries shows, the early adoption of mobile devices and the Internet in China, the United States, and the United Kingdom has led to faster and more widespread integration of digital technologies into financial services (Vimalkumar et al., 2021). These countries have a strong base of leading fintech companies, such as mobile payment services and Big Data-based online finance, which provide cutting-edge technology to the country's financial ecosystem (Curran & Smart, 2021). The top three countries also saw significant growth in access to payment services, credit, insurance, and wealth management through mobile money and other platform-based services. This finding reflects the fintech development has significant implications for financial and macroeconomic stability, making financial inclusion an achievable goal.

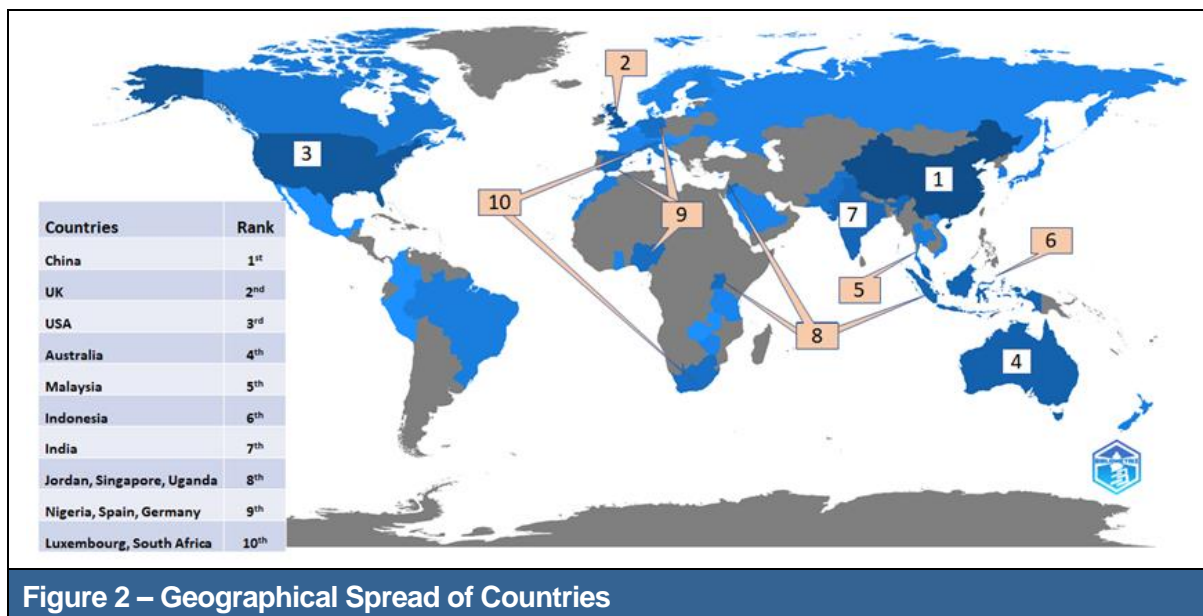
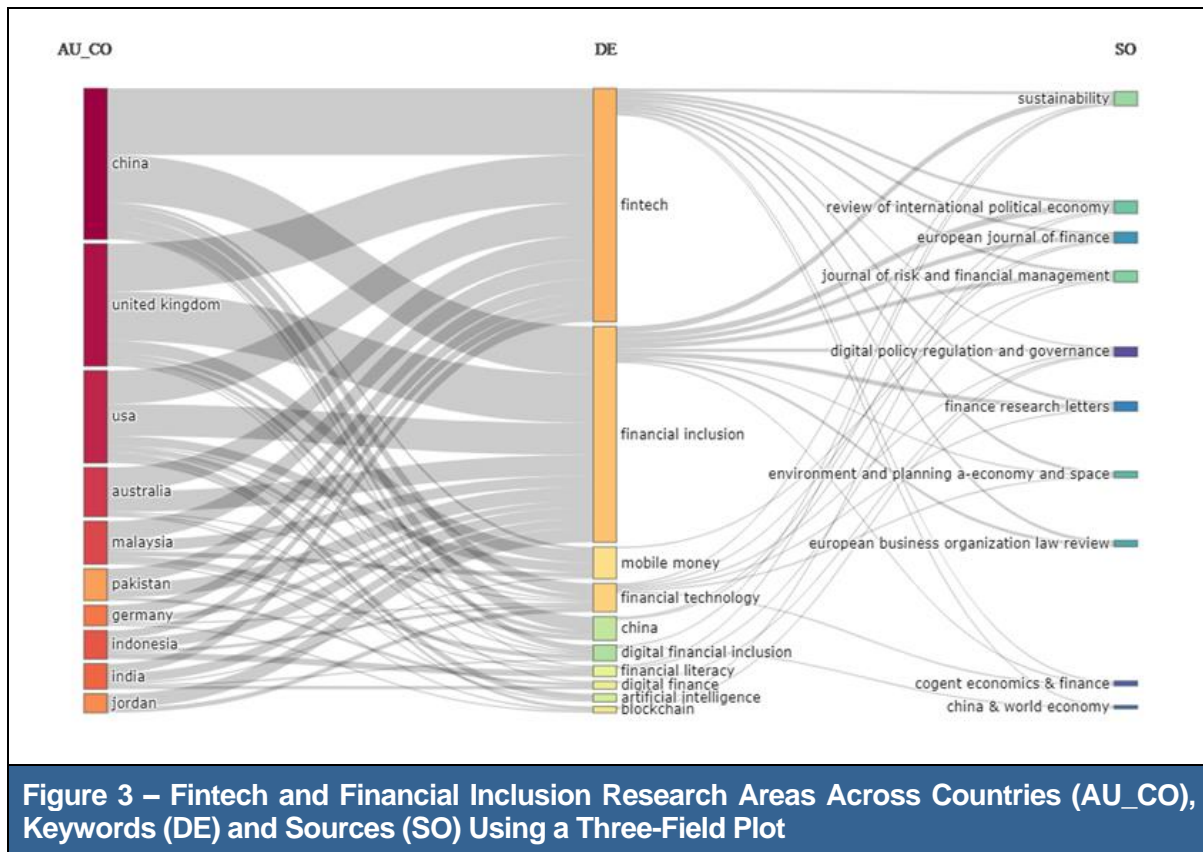


Figure 2 – Geographical Spread of Countries



Using a three-field plot, we performed a visualization based on countries (AU_CO - the first field), keywords (DE – the second field), and journals (SO – the third field) related to fintech and financial inclusion. This visualization is based on the well-known Sankey diagrams. It is helpful to illustrate the connections between multiple data components (nodes) and to perform a meaningful analysis. The size of each field indicates the frequency of occurrence of these data points. Figure 3 shows the ten boxes of the three selected fields. In the first field, the country perspective, we find six countries representing developing countries: China, Malaysia, Pakistan, Indonesia, India, and Jordan. In contrast, the United Kingdom, the United States, Australia, and Germany represent developed countries. The keywords that appear most frequently in the research results of the countries in the second field include fintech, financial inclusion, mobile money, digital financial inclusion, digital finance, and Blockchain.

The top keywords in published research articles from developing countries were mobile money, digital financial inclusion, financial stability, financial education, digital finance, and Blockchain. The third field, publication sources, shows that research articles in all top 10 countries deal with fintech, financial inclusion, and digital financial inclusion. When we combine the three fields, we see that research articles from these countries focus on the application of financial technologies and mobile money in their national initiatives to strengthen financial inclusion and improve digital inclusion. The research articles in developing (emerging and frontier) countries such as India, Indonesia, Pakistan, and Jordan also addressed the development of financial literacy to achieve financial stability.

Most Relevant Sources of Publication

A total of 138 different sources were included in our study. Of these, 84% were interdisciplinary sources, and the remaining 16% were finance and accounting. In Figure 4, we have listed the top 10 publication sources. The first three sources are: Sustainability was the most significant contributor, with seven research articles. The Journal of Risk and Financial Management and Review of International Political Economy had four articles each. Environment and Planning

A: Economy and Space, European Business Administration Law Review, and European Journal of Finance had three articles each. China & World Economy, Cogent Economic & Finance, Digital Policy Regulation and Governance and Emerging Markets Review had two articles each, respectively. The prominent sources are predominantly interdisciplinary and published research articles that link fintech applications to financial inclusion. These top sources included financial inclusion augmented by mobile money, digital finance, and Blockchain.

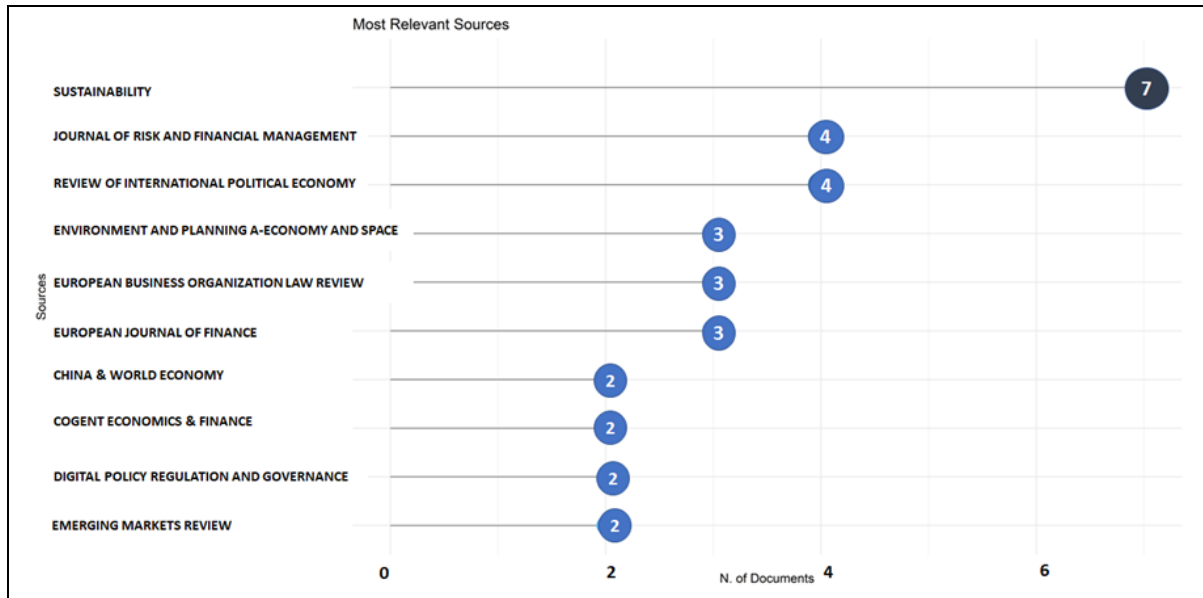


Figure 4 – Most Relevant Sources of Publication

Most Contributing Authors and Their Works

Figure 5 shows the top 20 authors who have written research papers on using fintech to promote financial inclusion. The vertical axis shows the authors (last names), and the horizontal axis refers to the timelines (in years). The dots denote the number of articles (N articles) based on the total number of citations per year (TC per year). Their research interests are interdisciplinary, as evident from their work, which primarily contributes to identifying and developing synergies between financial inclusion and fintech. Interdisciplinary areas include *mobile money and financial inclusion in MSMEs*; *digital consumer protection and financial inclusion*; *financial stability through digital finance*; and *sustainable financial inclusion through financial technologies*. For a comprehensive analysis of the contribution of the top authors (see Table 3; column 3 of the table summarizes the key findings of the authors' work). The table is sorted by the total number of citations and is limited to cited publications.

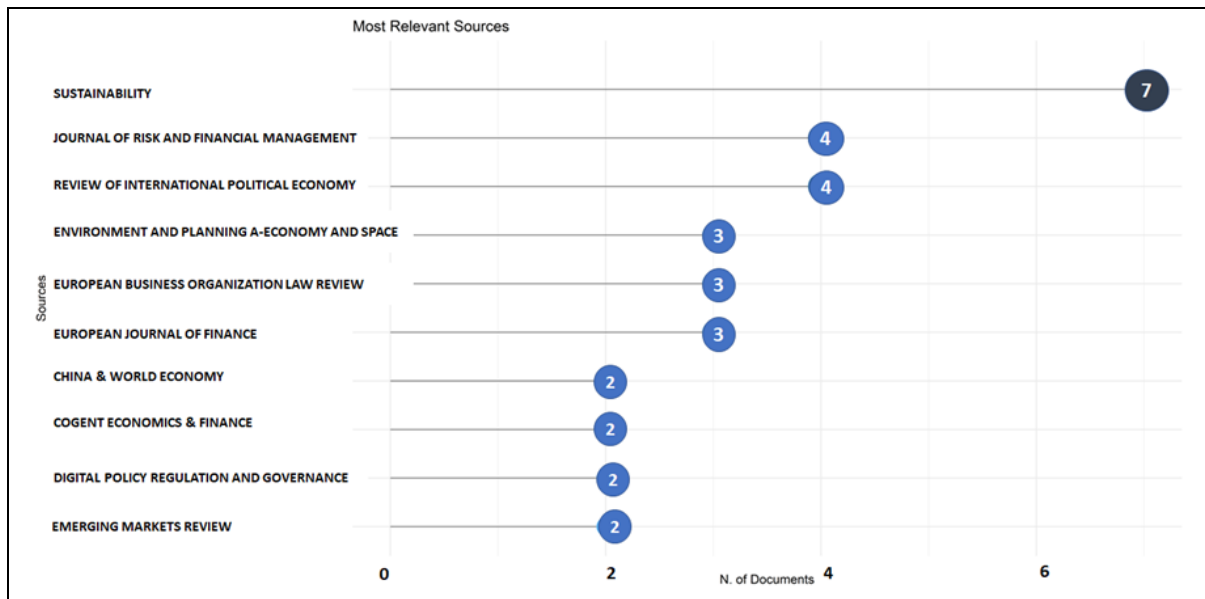


Figure 5 – Top 20 Authors’ Production of Research Works

Table 2 – Top Authors’ Research Production and Contribution Summary

Author	Title	Summary of Contribution	Total Citations	Total Citations per year
Ozili (2018)	Impact of digital finance on financial inclusion and stability	Applying digital finance in financial inclusion offers numerous benefits to stakeholders, including users, service providers, governments, and the economy. However, issues related to technology, people, and processes must be addressed if the benefits are to be realized holistically.	112	22.4
Bernards & Campbell-Verduyn (2019c)	Understanding technological change in global finance through infrastructures: Introduction to review of the international political economy special issue ‘The changing technological infrastructures of global finance’.	The study analyzed the growing claims about the promise and failures of emerging fintech used to promote financial inclusion and stability. The study recommends examining the infrastructure that enables technological change to ensure a smooth transition.	27	6.75
Ozili (2021a)	Financial inclusion research around the world: A review.	A comprehensive review study found that financial inclusion is affected by several factors, including the level of fintech innovation, the national poverty level, the financial sector’s stability, the state of the economy, financial literacy, and the legal framework of governments.	23	11.5

Table 2 – Top Authors’ Research Production and Contribution Summary

Author	Title	Summary of Contribution	Total Citations	Total Citations per year
Arner et al. (2020)	Sustainability, fintech and financial inclusion	The study highlights the role of fintech as a critical enabler of financial inclusion. Fintech is the foundation for sustainable, balanced growth defined in the United Nations Sustainable Development Goals (UN -SDGs). A progressive approach to developing the supporting infrastructure must foster digital transformation in the financial sector.	23	7.667
Bernards (2019a)	The poverty of fintech? Psychometrics, credit infrastructures, and the limits of financialization.	The study investigated the claim about the role of fintech in enabling broader access to credit and control.	22	5.5
Senyo & Osabutey (2020)	Unearthing antecedents to financial inclusion through fintech innovations	By applying the Unified Theory of Acceptance and Usage of Technology (UTAUT2), the study found that performance and effort expectations were essential to users’ intentions to use mobile devices to conduct financial transactions.	19	6.333
Gruin & Knaack (2020)	Not just another shadow bank: Chinese authoritarian capitalism and the “development” promise of digital financial innovation.	This study shows how digital financial innovation can promote a transparent banking ecosystem to minimize the negative impact of shadow banking practices in China.	14	4.667
Bernards (2019b)	Tracing mutations of neoliberal development governance: ‘Fintech’, failure and the politics of marketization.	The study examined the policy guidelines to promote emerging fintech as drivers of financial inclusion. The study is conducted against the backdrop of arguments that the emergence of technology does not promote the development of financial markets for marginalized populations.	13	3.25
Jones & Knaack (2019)	Global financial regulation: Shortcomings and reform options	The study explained the process of redesigning the non-bank financial system in China representing digital financial inclusion. The study noted a need to refine critical policies and practices to use digitalization to guide the inclusion process.	12	3

Table 2 – Top Authors’ Research Production and Contribution Summary				
Author	Title	Summary of Contribution	Total Citations	Total Citations per year
Zetzsche et al. (2019)	Fintech for financial inclusion: driving sustainable growth. Sustainable Development Goals: harnessing businesses to achieve the SDGs through finance, technology, and law reform	The study identified four critical pillars in addressing the challenges of transitioning from a manually collected identity to a digitally collected identity for the financial system. The pillars are simplified systems for account creation, electronic know your customer (e-KYC), interoperability in electronic payment systems, supporting infrastructure, and the design of digital financial systems.	8	2
Bongomin et al. (2019)	Digital financial innovations in the twenty-first century: Do transaction tax exemptions promote mobile money services for financial inclusion in developing countries?	The study found that tax exemptions for mobile money transactions will positively impact adoption and usage. The impact will promote financial inclusion in developing countries, including northern Uganda.	6	2
Coffie et al. (2021)	Determinants of fintech payment services diffusion by SMEs in Sub-Saharan Africa: evidence from Ghana	The study examined the determinants of adopting fintech in MSMEs in Ghana to improve financial inclusion. Fintech services included plastic money, mobile money, and e-money. The study found that a collaborative effort among businesses, people, and technology stakeholders will drive the adoption of fintech in Ghanaian MSMEs.	6	3
Ozili (2020)	Contesting digital finance for the poor	The study critically assessed digital financing as a pro-poor development finance intervention. The study found a lack of evidence on how digital finance can be used for socio-economic development. It addressed the risks of digital finance technologies for the poor population segment. Such a study is essential in the current context of technology diffusion and its rapid penetration of all segments of demographic profiles.	4	1.333

Table 2 – Top Authors’ Research Production and Contribution Summary

Author	Title	Summary of Contribution	Total Citations	Total Citations per year
Baber (2019)	Financial inclusion and fintech: A comparative study of countries following Islamic finance and conventional finance	The paper analyses countries following Islamic and traditional financial systems regarding fintech and financial inclusion. The study found a higher level of financial inclusion in countries following the Islamic system, leading to women’s empowerment. The number of fintech users in countries with conventional systems is growing too. The comparative study recommended defining more indicators of financial inclusion enabled by fintech.	4	1.333
Bongomin & Ntayi (2020)	Mobile money adoption and usage and financial inclusion: mediating effect of digital consumer protection	Digital consumer protection was critical in linking mobile money adoption and use. The linkage influenced financial inclusion in the MSMEs in northern Uganda.	3	1
Bongomin & Ntayi (2019)	Trust: a mediator between mobile money adoption and usage and financial inclusion.	The study showed that trust is an essential factor in the adoption and use of mobile money. The presence of trust will increase mobile money transactions, increasing financial inclusivity among MSMEs in rural Uganda.	3	1
Ozili (2021b)	Has financial inclusion made the financial sector riskier?	The risk posed by the increasing use of fintech products such as debit and credit cards differ between developing and developed countries. While risk decreases in developing countries, this is not the case in developing and emerging economies. When planning financial inclusion policies, it is vital to identify and assess the risks of fintech.	3	1.5
Al-Okaily et al. (2021)	Sustainable fintech innovation orientation: A moderated model.	The study examined the factors influencing the adoption of fintech services. The study identified various benefits for Jordan’s society, the environment, and ecology. The extended technology acceptance model (TAM) model was applied, which found that perceived usefulness and enjoyment positively and significantly impact the adoption of fintech services to promote digital financial inclusion.	3	1.5

Table 2 – Top Authors’ Research Production and Contribution Summary				
Author	Title	Summary of Contribution	Total Citations	Total Citations per year
Hasan & Hoque (2021)	How does financial literacy impact on inclusive finance?	The study addressed regional disparities in outreach and access to inclusive financial services. Inclusive finance is one of the emerging drivers of economic prosperity. The study examined the impact of financial literacy on access to microfinance through financial technologies using well-known economic models such as logistic regression, PROBIT regression, and complementary log-log regression. The study found that financial literacy significantly impacts people's intention to participate in and access financial products through technologies.	3	3
Senyo et al. (2022)	FinTech ecosystem practices shaping financial inclusion: the case of mobile money in Ghana	The study defines a roadmap for improving financial inclusion by adopting mobile money transactions. The study compared traditional money transactions with mobile transactions and positively impacted financial inclusion.	2	1
Banna et al. (2022)	Fintech-based financial inclusion and risk-taking of microfinance institutions (MFIs): Evidence from Sub-Saharan Africa	The study developed a new index to empirically assess the role of fintech-based financial inclusion on the risk-taking behaviour of microfinance institutions in sub-Saharan Africa.	2	1
Wang (2021)	Developments and Trends of China Internet Insurance from the Perspective of Digital Inclusive Finance System	Since the announcement of financial inclusion in 2016, the National Bank of China has issued relevant regulatory guidelines for inclusive finance. Indicators of inclusive finance have been developed and piloted in related areas such as internet insurance usage and service quality.	1	0.5
Banna et al. (2021)	Fintech-based financial inclusion and bank risk-taking: Evidence from OIC countries.	The study found that increased levels of fintech-based financial inclusion drove banks' risk-taking behaviour. The study discusses how fintech investments are exposed to market competition.	1	0.5
Knaack & Gruin (2021)	From shadow banking to digital financial inclusion: China's rise and the politics of epistemic contestation within the financial stability board	The study analyzed the role of digital financial inclusion in addressing the negative effect of shadow banking in the Chinese Financial System.	1	0.5

Table 2 – Top Authors’ Research Production and Contribution Summary				
Author	Title	Summary of Contribution	Total Citations	Total Citations per year
Lu et al. (2021)	Digital financial inclusion development, investment diversification, and household extreme portfolio risk	The study analyzed the impact of digital financial inclusion in developing a diversified portfolio to better control investment risks and returns.	1	0.5
Ji et al. (2021)	Has digital financial inclusion narrowed the urban-rural income gap: The role of entrepreneurship in China	The study analysed the impact of inclusive digital finance and produced four key findings. (a) Enabling the narrowing of the urban-rural gap and financial exclusion. (b) Enabling broader access to financial products for marginalised populations, (c) Reducing the urban-rural gap by promoting urban entrepreneurship, and (d) Enabling education and training to increase awareness and use of digital inclusive financial products.	1	0.5
Campbell-Verduyn et al. (2021)	Technology, small states and the legitimacy of digital development: combatting de-risking through blockchain-based re-risking?	The article illustrates how fintech can support risk mitigation efforts to underscore the legitimacy of operations in financial inclusion projects. The study proposed using Blockchain and digital ledgers to achieve legitimacy and risk mitigation in financial transactions.	1	0.5

Word Cloud of Author Keywords

The word cloud shown in Figure B.1 in Appendix B represents author keywords related to published articles that link fintech and financial inclusion. The figure shows prominent keywords (large) that occurred more frequently in the publications selected for systematic review. In addition to the most likely keywords, such as fintech and financial inclusion, several keywords explicitly highlight the relevance of ongoing research in developing countries. These include financial literacy, financial stability, financial regulation, digital finance, crowdfunding, mobile money, Islamic finance, P2P lending, microfinance, and MSMEs. The word cloud facilitates discussion of topics of particular importance in the following section.

Figure B.2 in Appendix B provides a complementary understanding of Figure B.1 in Appendix B by highlighting the growth of words from 2016 to 2022. From the figure, a growing interest is apparent in applying fintech to strengthen the inclusiveness of financial systems. The role of fintech in supporting economic efforts for financial literacy, stability, and digitalization is evident from the figure. In addition, AI research can accelerate sustainability goals in developing countries.

Thematic Analysis

In this section, we discuss the themes that emerged from the thematic analysis of the research publication. The analysis answers the first research question identified for the current study: What are the major themes associated with fintech and financial inclusion research? We

addressed our first research question by applying the concept map feature of the Leximancer software tool, a widely used quantitative content analysis tool (Manthiou et al., 2022; Perdana et al., 2015; Perdana et al., 2021b).

Leximancer was used to extract the key themes. We first ran Leximancer to pre-process the datasets used in this study that were noisy and characterized by unreliable spacing, paragraph breaks, words irrelevant to concepts, and weak semantic information. We then used Leximancer's feature to identify seed concepts based on word frequencies. We removed stop words (e.g., a, at, all, almost, are, however, but, is, on, the, were, what, want) to eliminate noisy data and identify relevant concepts (Leximancer, 2021).

Once the pre-processing of the text was complete, the concept map was created automatically by Leximancer. A concept map consists of several interrelated topics. The map was then adapted to create several overarching themes. This adaptation enabled the creation of fewer themes. A topic is a group or cluster of words with commonalities within the presented texts. The linked nodes highlight the words that underlie the identified themes (Leximancer, 2021). The topic's name is derived from the most frequent concept in each cluster or group (Leximancer, 2021). Before capturing the concept-maps and drawing conclusions, we conducted several iterations of the Leximancer analysis to identify relevant themes. Additional iterations help ensure that the themes in the concept maps remain stable and saturated, and that fewer and broader themes emerge. The consistency of themes and the absence of new themes indicate stability and saturation. We chose fewer themes (three to four) to facilitate the interpretation and analysis of the maps.

The concept map shown in Figure 6 identifies six major themes published in research papers on fintech and financial inclusion from 2016 to 2022. The themes are "financial inclusion," "financial system," "utilization," "technology," "lending," and "sector." These six themes comprise several concepts/themes identified in the research articles. For example, the central theme 'technology' contains 'innovation', 'platforms', 'information', 'products', 'technology' and others. The critical thing we need to understand here is that the themes do not represent isolated topics. Instead, they show how concepts cluster to initiate constructive discussions. The following subsections, 3.6.1 through 3.6.6, are developed based on the connections between the keywords in each cluster. The keywords allow tracing back to the original document(s). After a thorough reading of the documents, the topic-related content is presented.

Financial innovations in developing countries like Indonesia disrupt traditional business models (e.g., banking, investment, and payments). Innovative technologies can be introduced into mainstream transaction environments to strengthen financial inclusion (Tian & Kling, 2022). Another critical point is that financial inclusion must account for gender differences (Kim, 2022). Social and economic impacts may increase as financial services become more accessible to women. Therefore, women need to know how to use technology to access financial services through technology. Understanding this will empower the community's financial decisions (Suri & Jack, 2016).

The digitization of financial services profoundly impacts the accessibility of these services for the most vulnerable in society. Consequently, the impact could be helpful to national efforts to meet the United Nations Sustainable Development Goals (UN-SDGs). For example, a significant challenge in developing countries such as Jordan is the collaborative efforts to achieve financial inclusion for the masses by achieving affordability and availability (Lutfi et al., 2021). In this context, creating widespread awareness of the immense benefits of digital inclusion should not be underestimated. Another example, in developing countries like India, financial inclusion and digital infrastructure will assist in accelerating economic growth (Siddiqui & Siddiqui, 2020). The unprecedented growth of fintech is expected to increase economic growth by promoting broader financial inclusion.

Nevertheless, it is essential to recognize the impact of fintech on growth volatility, especially in emerging and developing economies (Gopalan & Rajan, 2021). Economies with a high need for financial inclusion have the most potential for fintech growth (e.g., the M-Pesa case in African countries). Combining need and potential provides the basis for formulating policies encouraging competitive investment. Several Southeast Asian countries, including Cambodia, Laos, and Vietnam, fall into this category (Van Loo, 2018)

Theme 2 – Fintech Adoption and Usage

The proliferation of mobile phones and their versatile technology allow seamless access to financial products and services (Malik & Singh, 2022; Shang & Chiu, 2022). Widespread mobile phone access opened the last mile to the unbanked population segment. Additionally, mobile access has enabled fintech to reach the bottom of the economic strata by enabling micro-money transactions (Museba et al., 2021). As a stimulant to economic growth, mobile financial transactions have also been cited as one of the critical factors in achieving one or more of the UN-SDGs 2030 goals (Kara et al., 2021).

Malik and Singh (2022) suggest that people are willing to adopt mobile payment platforms and continue to use them if they trust the platform. Developing countries such as Uganda have begun adopting tax exemptions that can encourage citizens and MSMEs to switch to mobile finance (Museba et al., 2021). Such policies encourage mobile money use and expand financial inclusion. Mobile payment use and financial education go hand in hand to strengthen financial inclusion. Initiatives to improve financial literacy increases the use of mobile banking. In other words, the increased use of cell phones to conduct financial transactions measures financial literacy in developing countries such as Indonesia or Bangladesh (Aziz & Naima, 2021; Kirana & Havidz, 2020).

Financial resilience is a critical factor in measuring the ability of the financial system to recover from unprecedented economic disruptions. One of the most critical lessons from the COVID-19 pandemic is the forced shift (through total lockdowns, business closures, and bans on physical movement) to digital financial transactions. There has been a tremendous increase in access to and use of digital applications to conduct daily financial transactions, boosting economic activity and enabling greater financial inclusion (Mansour, 2022).

Emerging economies are considering the use of mobile money as a widespread innovation. Efforts are being made to create an enabling environment where mobile financial services seamlessly flow into society and businesses (Kabengele & Hahn, 2021). The use of payment technologies in Taiwan, for example, enables personalized services and optimizes unique user experiences to attract and retain customers (Shang & Chiu, 2022). Two use cases are Easy Card and iPASS LINE Pay Money. To provide personalized services across physical boundaries, Easy Card uses smart chips and NearField Communication (NFC) readers. As a foundation for personalized user experiences, iPASS LINE Pay Money uses a digital wallet platform. With smart technology attributes, users enjoy differentiated service innovations, intimate relationships and ever-evolving opportunities to reward loyalty through differentiated service innovations and life-enhancing experiences (Shang & Chiu, 2022).

In developing countries, there is increasing emphasis on developing and promoting digital financial literacy among the population, with the dual goal of being “resilient and inclusive” (Kass-Hanna et al., 2022). Additionally, citizens’ technological understanding, underdeveloped banking systems, and a fintech-friendly regulatory ecosystem significantly impact fintech innovation and promote financial inclusion. Fintech applications embed short-term financial management tools which small firms and households can use to strengthen their efforts towards building financial resilience (Fu & Mishra, 2022). Fintech-driven financial inclusion is a crucial enabler of poverty reduction and economic well-being for populations at the bottom of the pyramid in developing countries (Bongomin et al., 2019).

Theme 3 – Fintech and Sectoral Growth

The sectoral growth rate could indicate changes in the economy and institutional sectors due to the fintech service. Democratizing access to financial services for marginalized segments is a critical success factor for promoting multisectoral growth. For example, developing countries like Kenya strongly emphasize the need for mobile technologies to promote financial inclusion in their social sector growth initiatives (Ndung’u, 2018). One of the biggest obstacles to national growth is the shadow economy in South Asia’s emerging economies. Digital finance can help minimize illicit economic activity and bring transparency and stability to financial inclusion efforts (Syed et al., 2021). Adopting digital and mobile financial services requires a critical review of current regulatory practices. This review will enable governments to identify and define constructive measures to smoothly transform the traditional financial system to accommodate the characteristics of digital technology (Suwandaarachchi et al., 2020). Fintech implementation should, therefore, increase inclusivity holistically (Lagna & Ravishankar, 2022).

The MSMEs sector is one of the most important sectors contributing to economic growth. Fintech is positioned as a growth stimulus for the sector to achieve better access and participation in financial inclusion initiatives (Baber, 2019; Zetzsche et al., 2019). However, the growth of financial inclusion in the rural sector is far from satisfactory, despite numerous attempts by traditional financial institutions (Lagna & Ravishankar, 2022; Neaime & Gaysset, 2018). Fintech can be a differentiator to provide greater financial outreach and broader access to the rural ecosystem, which traditional systems failed (Kong & Loubere, 2021). There is, however, a lack of a sound regulatory environment to keep pace with the growth of the fintech sector (Perdana et al., 2021b). The lack of such an environment will expose end users to risks.

Several emerging-market sectors are still unorganized and generally excluded from the existing financial ecosystem. The reasons for this are market imperfections and asymmetric information. Therefore, regulators must develop strategies that include the sector to promote financially inclusive growth (Ribeiro-Navarrete et al., 2021). Over the past decade, P2P lending, an alternative financing mechanism that enables direct trade between lenders and borrowers, has experienced rapid growth. P2P lending significantly reduces the involvement of intermediaries and enables the MSME sector to access low-cost, short-term financing (Thakor, 2020). Fintech enables a robust credit scoring process that helps needy borrowers

obtain credit. Lending through P2P platforms reduces operating costs and improves service quality (Jutasompakorn et al., 2022; Maier, 2016; Perdana et al., 2021a; Ribeiro-Navarrete et al., 2021)

Theme 4 – Fintech and Lending

Fintech lending success depends on expertise, compliance, differentiation, and collaboration. The fintech lending ecosystem is constantly evolving and is also fragmented. Therefore, companies must understand how to strategically align their business activities to get the most value from fintech lending (Basha et al., 2021; Lenz, 2016). Fintech is an integral part of any lending infrastructure. It is a technology that can create digital disruption and redefine financial inclusion plans to expand the supply of microcredit and financial services to marginalized and refugee populations in developing countries (Bhagat & Roderick, 2020). Underserved populations can benefit from online financing platforms because they are robust and transparent and build trust and security between borrowers and lenders (Salampasis & Mention, 2018).

Prior literature notes some potential from Islamic banking lending to accelerate financial inclusion (Nastiti & Kasri, 2019). In countries where lending follows the principles of Islamic banking, it promotes women's financial participation (Baber, 2019). Fintech-backed lending is driven by financial literacy and inclusivity. Islamic investment funds are better understood and desired by investors through fintech. Fintech increases investors' level of information and confidence in Islamic investment funds (Mutamimah & Sueztianingrum, 2021).

Islamic fintech improves the efficiency and effectiveness of funding the underserved demographic segment. It provides a robust knowledge platform to better advise the poor on their social finance strategies in the future (Ali et al., 2020). The Islamic finance industry is facing a paradigm shift with the introduction of fintech. The diversified portfolio of Islamic financial products is better positioned in the digital space and improves readiness to meet Industry 4.0 expectations (Ab Razak et al., 2020). Exploring current fintech-based Islamic lending practices will further the global movement for sustainable development goals in a local context (Hudaefi, 2020).

Theme 5 – Technology Shaping the Fintech

Integrating AI into mobile payment platforms improves the robustness of microcredit in both emerging and developed markets. The fintech services can better predict credit scoring issues and enable faster financial inclusion with AI (Bussmann et al., 2020). For example, AI applications improve financial inclusion by examining critical credit metrics such as approval, default, and false rejection rates (Kshetri, 2021). Credit scoring can also be combined with Blockchain, leading to secure digital identification. Tamper-proof digital ledger transactions increase network transparency and trust in the financial system. Such improvement promotes financial inclusion (Salampasis & Mention, 2018; Schuetz & Venkatesh, 2020).

The proliferation of data science in the fintech industry has led to a positive shift in financial inclusion efforts. The World Bank stated that applying AI to existing financial data can help digital financial service providers predict the response of potential and new customers when implementing financial inclusion measures (How et al., 2020). For example, a customized and innovative robo-advisory service based on AI enables predicting trends and recommending portfolios, leading to greater user confidence (Wang et al., 2019). AI should bring upheaval and innovation to the financial services industry. At the same time, it is essential to identify and analyze the challenges in implementing and operationalizing AI. The analysis will improve market penetration and reduce digital discrimination and last-mile connectivity for financial inclusion initiatives (Gupta et al., 2021; Truby, 2020).

Other than AI, adopting Blockchain can also potentially change fintech lending platforms. Blockchain can drive incubators and entrepreneurs to explore innovative ideas and turn them into financially inclusive products and services (Larios-Hernández, 2017). For example, Blockchain can lead to secure, faster, cost-effective, and transparent platform transactions. It also promotes better and more accurate monitoring of loan recoveries (Gonzalez, 2019). Blockchain-powered financial services are expanding the scope and practice of financial inclusion (Gonzalez, 2019; Larios-Hernández, 2017). Innovative features such as borderless, interoperable, and decentralized can enable the development of novel products and services by companies and startups (Chen & Bellavitis, 2020).

Theme 6 – Fintech and the Financial System

Fintech has become a key enabler for empowering citizens to make informed financial decisions. Globally, a fintech-driven financial system is increasingly recognized as achieving financial literacy (Kass-Hanna et al., 2022; Kirana & Havidz, 2020). The financial system's stability in developing economies has always been a matter of concern and an intensely debated topic. Technological innovation is rapidly changing the financial system and supporting the financial inclusion efforts of microfinance institutions. Technology-driven financial systems can promote stability (Banna et al., 2021).

Access to financial services for the non-bank customer segment is one of the innovative goals of a financial system. For example, the mobile money revolution reinforced the adoption of fintech in sub-Saharan Africa (e.g., M-Pesa). Its use expanded to several developing countries in Africa and Asia (Burns, 2018). A rapidly evolving financial system is characterized by well-designed fintech development that is easy to use and can be accessed by a wide range of demographic and geographic locations. Financial reforms supporting technology-enabled innovation create an inclusive environment for shadow banking (non-bank intermediaries outside traditional banks) (Gruin & Knaack, 2020).

Technology is a strategic differentiator for players in a competitive market. Competitiveness is measured by the ability of firms to create high value for their customers in the financial system (Nicoletti, 2017). Adopting fintech in a financial system depends on optimizing the cost of financial intermediation. Fintech firms mobilize information technology to provide services through a brokerage approach that proves less costly than commercial banks. Integrating financial technologies into banking and financial services can reduce the unit cost of intermediation by shifting business from a merchant to a broker. Therefore, financial regulatory policy should consider operational costs to pursue financial inclusion (Ioannou & Wójcik, 2022).

In summary, we have discussed the relationship between fintech and financial inclusion through a thematic analysis of six interrelated themes. The thematic discussion helps to understand the synergy between fintech and financial inclusion in a synthetic way. Figure 7 presents the research framework highlighting the existing research and future potential research areas. In the next section, we present the discussion to facilitate future research.

Existing Research in Fintech and Financial Inclusion		Future Potential Research in Fintech and Financial Inclusion
<p style="text-align: center;"><u>Themes</u></p> <p>1. Fintech and Financial Inclusion Financial inclusion should improve through fintech innovation. Through technology-enabled financial inclusion, people can access appropriate and transparent financial services.</p> <p>2. Fintech Adoption and Usage The adoption and use of digital technologies such as cell phones should go hand in hand to strengthen financial inclusion. Efforts should be made to create an enabling environment where digital technology services seamlessly flow into society and businesses.</p> <p>3. Fintech and Sectoral Growth Because of fintech services, the sectoral growth rate may indicate changes in the economy and institutional sectors. Promoting multisectoral growth requires democratizing access to financial services for marginalized population.</p> <p>4. Fintech and Lending Despite constant evolution, the fintech lending ecosystem is fragmented. The key to maximising the benefits of fintech lending is to strategically align business activities. A credit infrastructure can benefit from fintech lending. In developing countries, fintech lending can be used to expand access to microcredit and financial services for marginalized population and refugees.</p> <p>5. Technology Shaping the Fintech Fintech includes emerging technologies such as AI and blockchain. These technologies can improve fintech services and enable companies to develop new business models.</p> <p>6. Fintech and the Financial System Financial system stability in developing countries has always been a concern and an intensely debated topic. Technology-driven economic systems can promote stability. Fintech empowers citizens to make informed financial decisions. The adoption of a fintech-driven financial system is increasingly recognized as a sign of financial literacy.</p>	<p style="text-align: center;"><u>Summary of Contribution</u></p> <ol style="list-style-type: none"> 1. Impact of Digital Finance on Financial Inclusion 2. Digital Technology and Global Finance 3. Fintech and Sustainability 4. The Antecedents of Financial Inclusion 5. Digital Financial Innovation 6. Digital Technologies and Global Financial Regulations 7. Fintech as A Driver of Financial Inclusion 8. Digital Finance for the Marginalised People 9. Fintech and Customer Protection 10. Behavioral Aspect of Fintech 11. Sustainable Fintech Innovation 12. Fintech Ecosystem Supporting Financial Inclusion 	<p style="text-align: center;"><u>Themes</u></p> <p>1. Basic Research This research should address technologies for MSMEs. The research explores the benefits of innovative technologies such as credit scoring and digital KYC to improve the financial inclusion ecosystem, as well as the use of blockchain.</p> <p>2. Driving Research Research should be directed toward explaining the contributions of digital finance, AI, and Big Data technologies to the modernization of financial inclusion. Technological development, business (market) innovation expectations, cost savings requirements, and customer preferences are driving digital finance and financial innovation.</p> <p>3. Emerging or Declining Research Research articles that address the concepts underlying fintech and financial inclusion, on which there is little and weak research. Fintech regulation, financial intermediaries, and financial inclusion are initial research findings in emerging markets. Research should focus more on the challenges faced by policymakers and regulators.</p> <p>4. Niche Research International development is a topic relevant to the niche area. The goal is to analyze the regulation of platform-based lending in combination with fintechs to facilitate financial inclusion internationally. Unexplored areas include socio-legal research and international participation in fintechs such as M-Pesa that can facilitate financial inclusion.</p>

Figure 7 – Research Framework for Fintech and Financial Inclusion

Future Research Agenda for Fintech and Financial Inclusion

One of the aims of our current research work is to identify the future directions for research to explore and expand the knowledge gained. In other words, we discuss the answer to the second research question: *How can fintech research promote and accelerate financial inclusion?* Subsection 4.1 discusses directions for future work based on the themes developed and enumerates some relevant research questions to provide direction for future research.

Thematic Evolution of Fintech and Financial Inclusion Research Themes

We addressed our second research question by evaluating the findings from the thematic analysis using R software. The function combines performance analysis and scientific mapping to identify and illustrate subsets of fintech and financial inclusion concepts. It helps identify how research interests have evolved and provide insights into future research directions.

The analysis of thematic development is based on the authors' keywords (co-word network) and a cluster diagram (Cobo et al., 2011). The result of the analysis is a thematic map with four distinct and informative quadrants. The horizontal axis indicates the degree of relevance (topic centrality), and the vertical axis indicates the degree of development (topic density). Centrality measures the degree of network interaction (strength of external connections to peer topics). Our current research measures the relevance of a research topic (the degree of importance) to the contribution to the field under study. The degree of importance is characterized by novelty, usability, and measurability, for example, the contribution of AI to the combined research of fintech and financial inclusion. While the adoption of AI is still evolving, studies can invoke the use of AI to make the financial inclusion process more efficient, and metrics can be developed to make the results scientifically measurable. Density measures the internal strength of a network, i.e., the interconnectedness of all keywords that explain a research topic. Here, this research measures the degree of development of a particular topic. For instance, the higher the density of digital finance and financial innovation, the higher the chances of future development of this topic in fintech and financial inclusion research. Figure 8 displays the thematic development of fintech and financial inclusion topics.

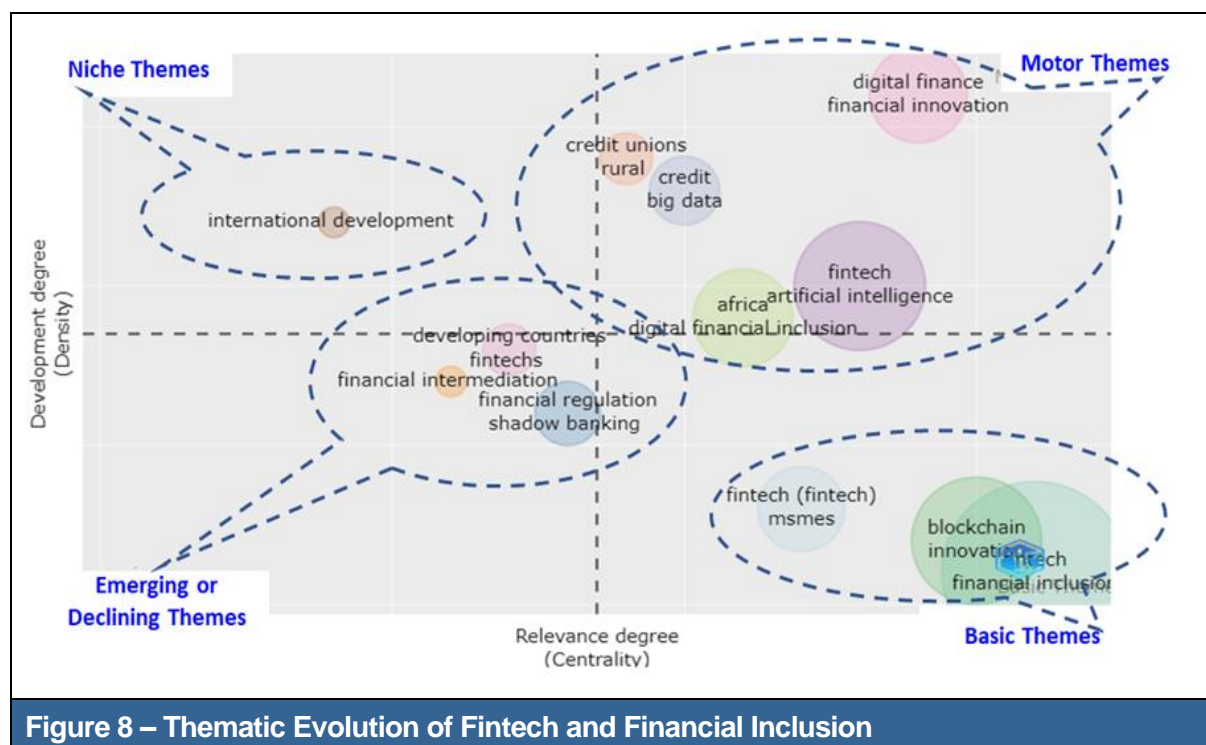


Figure 8 – Thematic Evolution of Fintech and Financial Inclusion

The basic idea of density and centrality measurement is to understand the development stages of the studied topics within a broad research topic. Four topic clusters are based on the centrality and density measurements (Cobo et al., 2011; Janik et al., 2021). The topics are (a) basic themes that are underdeveloped but can play an essential role in advancing the research under study; (b) driving/motor themes are well-developed and essential for structuring the research field; (c) emerging/declining themes are those where research development is marginal and weak; (d) niche themes with a reasonable degree of well-developed internal association but with a low degree of external association. The following sections discuss the themes around fintech and financial inclusion, discuss the direction and define potential future research questions.

Basic Research Theme (Low in Density and Centrality)

The basic research topic consists of keywords that have emerged from the articles. The theme primarily refers to the research areas still developing but can contribute significantly to their growth and development. The research contribution refers to financial technologies for MSMEs and blockchain applications. The research explores the benefits of innovative technologies such as credit scoring and digital KYC to improve the financial inclusion ecosystem. Fintech companies have begun to develop new business models to capitalize on the Industrial Revolution 4.0. This has led to the financial services and banking sector becoming increasingly digital. Companies are also using cloud and blockchain technologies to influence the future business models of the fintech industry. We have identified several fintech-related areas that may interest researchers (e.g., blockchain, credit scoring, crowdfunding, cross-border remittances, digital KYC, innovation, and microfinance). The above discussions lead to the potential future research questions in Table 3.

Table 3 – Potential Research Questions on Fintech and Financial Inclusion from Basic Theme

Potential Future Research Questions
<ul style="list-style-type: none"> • Can fintech create an enabling environment for financial inclusion initiatives in developing countries? • How can Blockchain ensure a robust credit scoring mechanism for microcredit to provide fair and unbiased access to credit for the disadvantaged? • How can fintech lending enable faster and easier access to finance and reliable legal protection for MSMEs? • What are the critical application areas of fintech to facilitate access to and support short-term financing for MSMEs?

Driving (Motor) Research Themes

The theme identifies the research areas that are well-developed and critical to structuring research related to fintech and financial inclusion. The research primarily concerns financial inclusion through digital finance, AI, and Big Data technologies. Technological development, business (market) innovation expectations, cost savings requirements, and customer preferences are driving digital finance and financial innovation. The use of mobile money in some African countries is an example of how this digital finance innovation has helped accelerate economic growth. With this innovation, government and entrepreneurial initiatives in developing countries can improve the wealth of households at the bottom of the pyramid and increase financial inclusion. This initiative enables individuals and small businesses to access a wide range of financial products and services, contributing to economic growth and creating an environment of financial inclusion. As a result of the development of fintech through digital platforms, financial inclusion is being improved by expanding services such as mobile money, internet banking, and digital finance.

Fintech topics such as Big Data analytics, cloud computing, and AI are crucial in improving financial services. The use of technology is expected to lead to better financial services. For example, various services have emerged in India due to technological advancements, such as P2P lending, invoice financing or supply chain financing, crowdfunding, payday loans, merchant cash advances, buy now pay later, online vendor financing, and franchise lending. However, using fintech services may be challenging for underprivileged people due to inadequate literacy skills, limited internet access, and the cost of fintech. These barriers must be overcome to provide financial services at an affordable price. Based on our analysis, the potential future research questions are presented in Table 4.

Table 4 – Potential Research Questions on Fintech and Financial Inclusion from Motor Theme

Potential Future Research Questions
<ul style="list-style-type: none"> • In what ways could synergies between AI and fintech lead to a continuous acceleration of financial market automation and analysis of primary and secondary markets? • How can fintech startups foster innovation in a country's macro-and microeconomic system? • How can responsible use of technology foster financial inclusion? • How can the governance, ethical, legal, and social impact of technologies in financial inclusion be appropriately addressed? • How can fintech adoption contribute to a country's inclusive growth through digital innovation? • How can fintech networks and startups help foster financial inclusion in a post-COVID-19? • What is the biggest challenge in adopting technology for financial inclusion? • To what extent are financial institutions prepared for the privacy and security issues that may arise from digital and decentralized finance? • To what extent can fintech leverage Big Data analytics to achieve agility, accuracy, and acceleration of financial reporting in a post-COVID-19?

Emerging or Declining Research Theme

Low density and low centrality characterize this theme. Research on the regulatory and policy foundations of fintech and financial inclusion needs to be more extensive and sufficient. Research in emerging markets, including regulatory developments related to fintech, financial intermediaries, and inclusive finance, is still in its infancy. More focus should be placed on the challenges facing policymakers and regulators. On the other hand, fintech applications for newer financial products are beginning to emerge in research. This presents regulators with the question of how to keep up with innovation. Lessons from fintech experiments, e.g., on regulatory sandboxes, can help advance fintech and financial inclusion. Accordingly, more research should be conducted on policy and financial regulatory issues. Table 5 shows the possible future research questions.

Table 5 – Research Questions on Fintech and Financial Inclusion from Emerging/Declining Themes

Probable Research Question(s)
<ul style="list-style-type: none"> • What risk management strategies exist to complement the adoption of fintech in financial regulation? • How can fintech risk management strategies instill confidence and transparency in users in developing countries to accept digital payments? • Can fintech address the financial crisis caused by shadow banking in emerging markets?

Niche Theme

Research articles relevant to niche research areas focus on international development. This study explores how platform-based lending can be complemented by fintech to support the international development of financial inclusion. Future research should pay attention to the irregular access of fintech companies to financial inclusion at the international level regarding

financial inclusion standards. For example, sociolegal research and engagement with international policy and economics, such as M-Pesa, are unexplored areas. Some financial services are inaccessible to the underclass or the bottom of the pyramid in developing countries. Fintech could be a game changer in developing countries. Fintech can not only have a social impact but also help communities thrive. This initiative aligns with digital financial inclusion (DFI) and the UN SDGs. One shortcoming of the global fintech ecosystem is the inconsistency of cross-border transaction costs. Accordingly, the following potential future research questions are presented in Table 6.

Table 6 – Potential Research Questions on Fintech and Financial Inclusion from Niche themes

Potential Future Research Questions
<ul style="list-style-type: none"> • Can the internationally prevalent operational differences of fintech be standardized to enable broader financial inclusion? • How can fintech and digital technologies support financial compliance at the macro and micro levels?

Practical Contribution

Our research provides insights to accelerate fintech growth and financial inclusion in Asian countries. The fintech industry has driven innovation in the Asian region. The region has seen the emergence of a growing number of fintech companies offering innovative products and services that are transforming the financial industry. The region is at the forefront of the adoption and growth of digital financial services. By providing access to financial services to previously underserved populations, fintech has contributed to greater financial inclusion in Asia. With mobile banking and electronic wallets, people can now access banking services, make payments, and transfer money even in remote areas where traditional banking is challenging. The future research areas and research questions we propose may help regulators map the potential areas that need further exploration to accelerate financial inclusion in Asia.

Fintech services are available in several Asian countries, including Thailand (e.g., K PLUS and SCB Easy, TrueMoney and PromptPay), Vietnam (e.g., Momo and ZaloPay), Malaysia (e.g., Maybank2u, CIMB Clicks, GrabPay and Boost) and Indonesia (e.g., BCA Mobile, Go Mobile, OVO and DANA). These services allow users to make payments, transfer money, and access banking services from their mobile devices. In addition, these initiatives are in line with the governments of these countries in terms of promoting cashless transactions and improving financial inclusion^{2,3,4}. By leveraging digital finance, companies have gained easier access to capital, allowing them to expand and create jobs in Asia. The accelerated adoption of fintech and financial inclusion may have some consequences for the industry and consumers, for example, in terms of risk management. Regulatory requirements should therefore evolve to support innovation and mitigate potential risks.

The digitalization of finance has also helped increase the efficiency of financial systems, reduce transaction costs, and improve overall productivity. Fintech in Asia has given regulators better tools to monitor and regulate financial systems. The use of digital technologies can also potentially reduce financial crime by providing a better method of tracking financial

²<https://www.bangkokpost.com/business/2480872/rise-of-online-payments-accelerates-march-to-cashless-society>

³<https://vir.com.vn/cashless-payments-take-over-the-streets-95753.html>

⁴<https://themalaysianreserve.com/2022/06/17/cashless-society-in-malaysia-within-3-years/>

transactions and improving anti-money laundering measures. As a result, digital finance has positively impacted Asian countries by improving financial inclusion, and economic growth, enhancing consumer convenience and financial stability.

Conclusion

This study provides ample evidence of the synergies between fintech and financial inclusion research. Three aspects of this study contribute to existing knowledge. First, the descriptive analysis maps existing research on fintech and financial inclusion. Second, the qualitative analysis provides a comprehensive overview of how fintech and financial inclusion topics are interconnected. Third, future research areas for fintech and financial inclusion were identified. Overall, fintech democratizes financial inclusion for the unbanked and marginalized communities while reducing operating costs. Governments should promote financial inclusion among those most vulnerable and affected by global threats.

Current research inevitably has certain inherent limitations. These limitations are mainly due to the number of articles selected, the choice of databases, and the timeliness of the study. The search terms used to search the academic databases, and the exclusion and inclusion rules were determined solely to the researcher's knowledge, which may have influenced the study results. Due to the exploratory nature of the literature review on the link between fintech and financial inclusion, subjectivity may influence the analysis of the content. However, our study provides initial steps toward identifying synergies between fintech and financial inclusion and potential questions for future research. Future validation and comparison studies could therefore motivate an expansion and validation of the scope of the current study. In addition to the current work, analytical techniques, including semantics, could facilitate the development of new terms, themes, and concepts.

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Appendix A

Table A.1 – Scopus Query String Results		
Iteration	Query String	Documents count
1	TITLE-ABS-KEY ("fintech" OR "Financial technology" AND "Financial Inclusion")	221
2	TITLE-ABS-KEY ("fintech" OR Financial technology" AND "Financial Inclusion") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE , "cp"))	188
3	TITLE-ABS-KEY ("fintech" OR Financial technology" AND "Financial Inclusion") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (LANGUAGE , "English"))	185

**TITLE-ABS-KEY – Title Abstract and Keyword; DOCTYPE, "ar" denotes 'Articles' and DOCTYPE, "cp" denotes 'Conference papers'

Table A.2 – WoS Query String Results		
Iteration	Query String	Documents count
1	TS=((“fintech” OR “Financial technology” AND “Financial Inclusion”)) and Articles or Proceedings Papers (Document Types)	1551
2	TS=((“fintech” OR “Financial technology” AND “Financial Inclusion”) and Articles or Proceedings Papers (Document Types) and English (Languages)	1387

Table A.3 – Systematic Query Results	
Query String	Documents count
> library(bibliometrix)	1572
> library(xlsx)	
> setwd("C:/Users/.../Downloads")	
> web_data<-convert2df("WoS.txt")	
> scopus_data<-convert2df("scopus.bib", dbsource = "scopus", format = "bibtex")	
> combined<-mergeDbSources(web_data, scopus_data, remove.duplicated = T)	120
> write.xlsx(combined,"combinedscowos.xlsx")	1452

Table A.4 – Review Principles for Inclusion and Exclusion			
Criteria	Code	Reason	Description
Exclusion	EX-1-NEL	Non-English	The papers are written other than in English Language (NEL)
	EX-2-IR	Irrelevance	Not an academic publication. Other than journal articles and conference proceedings, and editorial content, conference precludes and forewords
	EX-3-WR	Weak relevance	The concept of fintech is not related to the concept of Financial Inclusion
	EX-4-WR		The publication did not focus on the application of fintech towards enabling financial inclusion
	EX-5-WR		The use of fintech is only a part of future research and conclusion
	EX-6-WR		Fintech and Financial inclusion are used only as a keyword and/or in references
	EX-7-WR		Fintech is used only as an example in a study about financial inclusion
Inclusion	IN-1-VL	Vital	Papers contain extensive discussion on fintech and financial inclusion.
	IN-2-EL	Essential	Papers contain considerable coverage of fintech but less discussion in financial inclusion.
	IN-3-RE	Reasonable	Papers are reasonably relevant and contain some fintech concepts and discussions.

About the Authors

Vijayakumar Bharathi S is a Professor of IT Business Management at Symbiosis Centre for Information Technology, Symbiosis International (Deemed University). He holds a postgraduate degree in Commerce and Management. He completed his PhD in Computer Science from Symbiosis International University (SIU), Pune, in ERP risk assessment for small and mid-sized enterprises. Prior to joining the academia, he worked as a costing officer in textile machinery industry. He is currently a member of the SAP Academic Alliance Board (the Asia Pacific and Japan). He specialises in delivering lectures on Intelligent ERP using S4 Hana, SAP Analytics Cloud, developing and delivering SAP curriculum. His research interests include design thinking, process mining, technology adoption models, and industrial applications of blockchain. His research has been published in *Thinking Skills & Creativity* (Elsevier), *Benchmarking* (Emerald) and *Global Journal of Flexible Systems Management* (Springer), among others.

Arif Perdana works as Associate Professor in Data Science at Monash University. Prior to his academic career, Arif worked in the IT service and finance industry. His research interests are data science, analytics, and digital technology strategy (e.g., blockchain, fintech and regulatory technology). Arif has conducted industrial research and consulting with institutions and companies in Singapore and Indonesia. His research has been published in *Information & Management*, *Behaviour & Information Technology*, *Journal of Information Systems*, *Telematics and Informatics*, *Technology in Society*, *Australasian Journal of Information Systems*, and *Journal of Information Technology Teaching Cases*.

Mugdha Shailendra Kulkarni is an Associate Professor of accounting and finance at Symbiosis Centre for Information Technology, Symbiosis International (Deemed University), Pune, India. She received her PhD in the field of intangible asset management. Her research interests include intellectual capital valuation, mutual funds, blockchain, technical analysis, stock price forecasting, and financial fraud detection. Prior to her academic career, she worked as a federal and state tax advisor in the United States.

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