

Tracing the knowledge landscape of financial technology: A bibliometric mapping of global scholarly output



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ABSTRACT

This bibliometric analysis examines the development and structure of financial technology (fintech) research from 2015 to 2023, using publications from the Scopus database. Visualization tools highlight growth patterns and collaboration networks. The results show a sharp increase in research, with a focus on innovation and blockchain technology. Countries such as China and the UK produce the most studies, while other countries have higher citation impacts, showing their influence. Differences in key metrics are also found across various journals. By analyzing this rapidly evolving field, this study offers insights for future research and promotes integrated perspectives.

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1. Introduction

Financial technology, or fintech for short, is the term for the use of technology in the provision of financial services (Bajwa et al., 2022; Sanga and Aziakpono, 2023). Fintech, a recent development in finance, showcases how technology is shaking up traditional service methods. To stay relevant, software and apps are essential, competing with and enhancing old financial systems. This evolution involves integrating new technologies to deliver traditional services effectively (Liem et al., 2022; Farok and Mahmud, 2023). Digitizing services transform traditional company operations from cash-based to technology-based. Fintech refers to the digital technology that is being utilized to speed the development of innovations in sectors such as savings and loaning services, peer-to-peer (P2P), social media usage, investing, financial markets, trading, and risk management (Handayani et al., 2022). According to Otieno and Kiraka (2023), fintech aims to lower the cost of financial services and overcome difficulties in financial contracting, thereby promoting consumer welfare.

The term "fintech" originated in the early 1990s through the "Financial Services Technology

Consortium" initiated by Citigroup. Attention to fintech intensified around 2014, signifying a substantial sector with investments ranging from \$12 billion to \$197 billion by 2014, involving both startups (fintech 3.0) and established institutions (fintech 2.0). The industry's rapid growth has attracted increased regulatory focus, given fintech's vital role in financial infrastructure and operations. Fintech has gone through four phases of development (Arner et al., 2018a; 2022). Fintech evolved through phases. Fintech 1.0 (1866–1967) used analog methods. From 1968 to 2008, fintech went digital with tech advancements. Fintech 3.0, starting in 2009, brought digital services, startups, cryptocurrencies, and smartphones to developed nations. Fintech 3.5 aims to extend these to developing economies for development and financial inclusion. Fintech 4.0, since 2018, introduced Neobanks and non-fungible tokens (NFTs).

Fintech challenges traditional financial services with technological advances. Researching created software and apps reveals how new technologies reshape traditional services. Understanding how these technologies compete with and complement conventional financial systems is crucial (Caciatori Junior and Cherobim, 2020). Fintech is a conglomeration of creative approaches to doing business, innovative uses of technology, and unique goods and services that shake up the financial services industry. The numerous advantages it offers have garnered a lot of interest, including increased operational efficiency, decreased operational costs, democratized access to financial services, new opportunities for entrepreneurship, and disruption

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of existing industry structures and boundaries (Agarwal and Zhang, 2020; Cao et al., 2020; Contreras Pinochet et al., 2019; Wang et al., 2021; Suryono et al., 2021). Fintech encompasses several key technologies, including (the Internet and the Web of Thin artificial intelligence (Belanche et al., 2019), distributed technology (blockchain and cloud computing) (Chen et al., 2019), and security technology (biometric technology) (Fosso Wamba et al., 2020). Fintech is simply the use of technology in the financial industry. The banking sector was one of the first to use computers commercially; a bank purchased the first mainframe ever constructed for use in commerce (King et al., 2021). One instance of fintech is the 1967 launch of the Automatic Teller Machine (ATM) by Barclays Bank (Ahmi et al., 2020). The most significant financial innovation in the past 20 years is the ATM, which has greatly assisted people by reducing the need for bank visits. Further advancements in mobile, internet, and blockchain technologies have also transformed the financial and banking sectors (Ahmi et al., 2020).

Although there is a growing interest in the subject, as seen by the rise of fintech papers after 2015, which account for 95.28% of the total according to Web of Science (WoS) statistics (Arner et al., 2018b; Wang et al., 2018). Tepe et al. (2021) highlighted the growing research interest in fintech across several academic areas from 2015 to 2022, based on Scopus datasets. The author's results suggest that business management contributes the most (22.7%), followed by computer science (18.2%), economics (16.7%), and social sciences (13.3%). Medicine (1.1%), mathematics (3.2%), energy (2.6%), environmental studies (3.4%), decision science (5.9%), and engineering (8%) all make significant contributions, with an extra 4.9% coming from other areas. This thorough survey emphasizes the multidisciplinary character of fintech research, demonstrating its broad effect and collaborative efforts across various academic areas. The notable expansion of financial technologies has prompted inquiries from scholars and professionals. The need for the current study has demonstrated why this research is worthwhile. Consequently, the purpose of this study is to record the development of the knowledge base of fintech. The bibliometric approach addresses the following questions: (1) What is the overall research landscape of fintech? (2) What are the major research themes and trends in fintech research? (3) What are the efforts and returns of cross-country comparisons in fintech publications?

2. Methodology

This study employs the technique of science mapping to create a comprehensive overview of the current body of knowledge on fintech. The analysis of research mapping entails examining scholarly articles and literature and considering their bibliometric data (Morris and Van der Veer Martens, 2008). Bibliometric analysis, also known as

scientometric analysis, is a common method used to investigate and visualize the connections between scientific ideas as they evolve over time (van Eck and Waltman, 2010). These connections can be studied using various units of analysis, such as keywords, authors, publications, journals, institutions, and countries (Cobo et al., 2011).

A science mapping analysis can be segmented into seven distinct stages: data acquisition, preprocessing, network extraction, normalization, mapping, research, and visualization (Cobo et al., 2012). It is important to acknowledge, however, that the specific order of these stages may vary depending on the software employed for the analysis, as certain software programs will execute them concurrently through a streamlined set of actions. VOSviewer, for instance, can expedite the processes of network extraction, normalization, mapping, analysis, and visualization once the requisite parameters have been configured (Mohamud, 2023). Some scholars advocate condensing these stages into three more general phases: data identification, acquisition, and analysis (Narong and Hallinger, 2023). The subsequent section details the steps undertaken by the researcher to gather and analyze the data for the present investigation.

2.1. Search strategy

In the field of bibliometric research, the careful selection of appropriate keywords is of paramount importance. To align with the research inquiries, this study focused its search on two primary title keywords: "fintech" and "financial technology." This deliberate choice led to the formulation of two distinct keyword combinations aimed at encapsulating the essence of the study's theme. Recognizing the crucial role that an article's title plays in capturing readers' attention, the titles were carefully crafted to convey information effectively. The search queries employed for this study were structured around the TITLE parameter, focusing on "Financial Technology." For the scope of this investigation, the Scopus database was chosen, covering the period from 2015 to 4 January 2024, given its status as the world's largest citation and abstract database housing scholarly works from international publishers. Renowned for providing a comprehensive platform for scientific scholars, Scopus stands out for its versatility in publications, facilitating keyword searches, and supporting bibliographic analysis, known as scientometric, as noted by Heldens et al. (2020) and Abdullahi et al. (2023). In comparison to Web of Science, Google Scholar, and PubMed, Scopus exhibits superior coverage in citation analysis, surpassing Web of Science by 20% and offering more consistent results than Google Scholar. Despite the common use of PubMed in scientific research (Mohamud (2023), this study aligns with Scopus due to its extensive coverage and reliability. Fig. 1 visually represents the systematic search strategy and detailed steps

employed in the data collection process, emphasizing the meticulous approach in utilizing

Scopus as the primary database for this research.

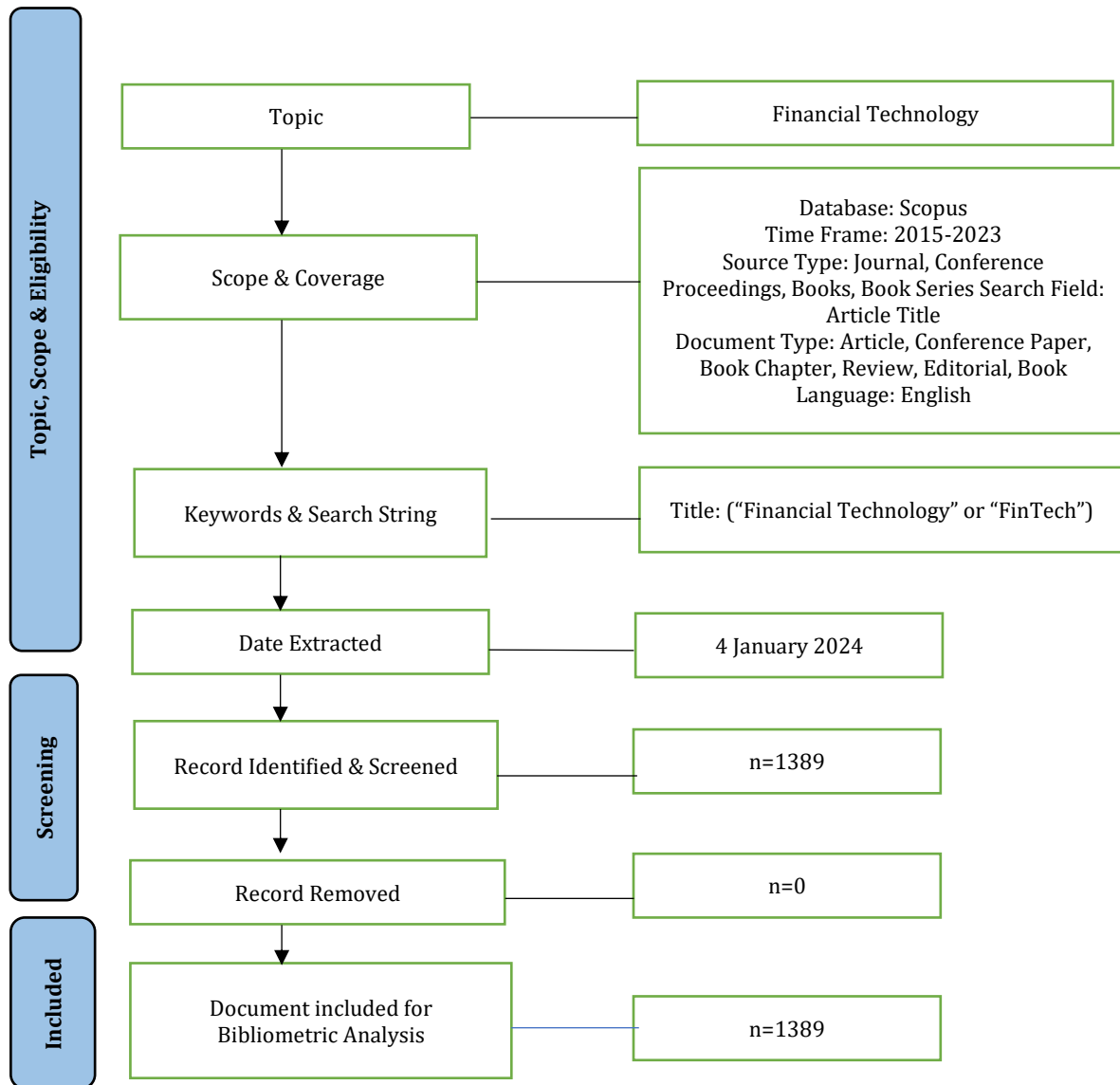


Fig. 1: Flow diagram of article searching strategy of fintech (Zakaria et al., 2021)

2.2. Tools and data analysis

In the realm of data analysis tools, VOSviewer has gained widespread prominence across diverse fields, including social media, business intelligence, knowledge management, supply chain and logistics, presumption, and brand personality analysis. This study strategically employed VOSviewer to address its research objectives and questions within the fintech domain, owing to the tool's extensive usage, user-friendly interface, and flexible capabilities. By leveraging VOSviewer's functionality for bibliometric analysis, the study visually represented the geographical distribution, authorship, citations, keywords, and collaboration among countries. Excel will be used to arrange data and numbers with functions and formulas and make statistical graphs. The employed diverse mapping methods, rooted in normalized term co-occurrence matrices and similarity measures, effectively portrayed distinct features of literature structures (Abdullahi and

Mohamud, 2023). Through the analysis of citations and bibliographic coupling links, VOSviewer facilitated the identification of cohesive research areas, contributing to a comprehensive understanding of the fintech research landscape. Additionally, Microsoft Excel 365 tools were utilized to analyze primary data extracted from the Scopus Database in CSV format. The study aimed to elucidate the overall research landscape of fintech, identify major research themes and trends, and assess the efforts and returns of cross-country comparisons in fintech publications.

3. Results and discussions

3.1. The distribution of scholarly works and citations

Fig. 2 depicts the evolution of fintech research from 2015 to 2023, which provides useful insights into the dynamic nature of academic interest and its

effect in this sector. Notably, the number of publications increased steadily between 2015 and 2017, indicating the rising acknowledgment of fintech as a blossoming study subject. The surge in 2017 emphasized a crucial point when fintech

attracted major attention. However, an unexpected feature emerges as the total citations did not uniformly correspond with the upward trend in publications over this time, implying a complicated link between research output and impact.

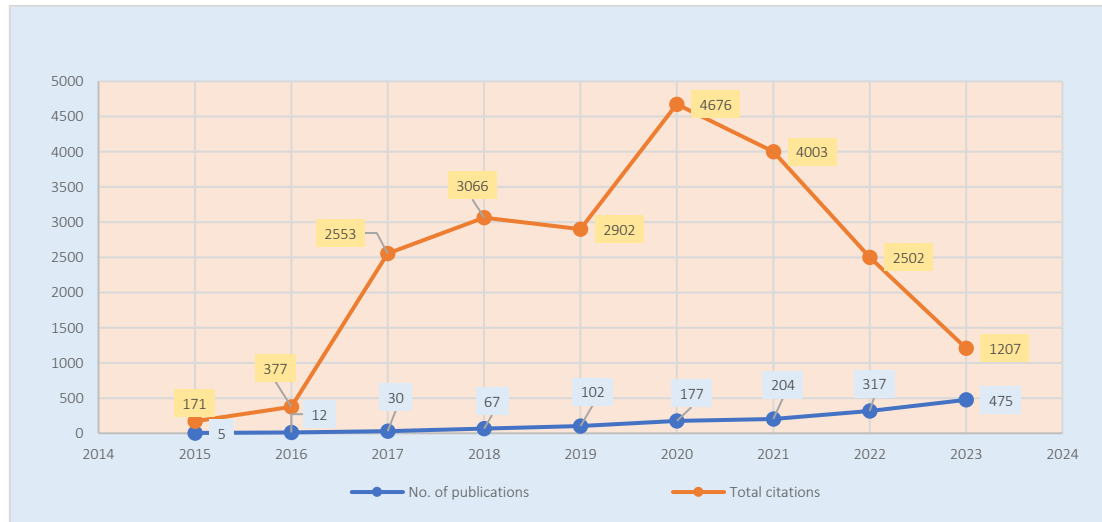


Fig. 2: The total number of publications and the number of articles

Subsequently, in 2018, fintech research started a period of exceptional development, defined by a significant increase in publications, reaching a peak of 475 in 2023. This exponential rise indicates a persistent and heightened interest within the academic community. Concurrently, total citations increased, reaching in 2020. This suggests that the increase in research production was accompanied by a concrete impact, as fintech literature received significant attention and acknowledgment from scholars.

Looking at the most recent years, 2022 and 2023, the number of publications continued to rise, but the total citations experienced a notable decrease. This discrepancy may suggest that while the quantity of fintech research remains high, the overall impact may be plateauing or encountering diminishing returns. Researchers and scholars in the field may need to explore new avenues or focus on synthesizing existing knowledge to maintain a balance between quantity and impact in fintech research.

3.2. International contribution and collaboration

Fig. 3 presents a comparative view of the research output and its impact from various countries in the field of fintech, as measured by Total Documents and Total Citations.

The United Kingdom emerges as a leading contributor in terms of impact, with a notable citation count of 4271 against 127 documents, indicating a high degree of influence and recognition within the international academic community. The United States follows closely with 3814 citations for 170 documents, reflecting substantial research activity and significant impact.

China, while having a higher number of Total Documents (289), accrues a lower citation count (4103) than the United Kingdom, suggesting a prolific research output with a comparatively moderate citation impact. This could imply that a rapidly growing research domain within China is starting to gain traction in terms of global influence.

Countries such as Australia and India, with 48 and 102 Total Documents, respectively, demonstrate a more modest presence in the field. However, Australia's documents garner a high citation count (1771), which may indicate a smaller but highly influential body of research.

On the lower end, the Russian Federation and Jordan, with 43 and 51 Total Documents, respectively, exhibit minimal impact in terms of citations, suggesting either an emerging stage in fintech research within these countries or a focus on niche areas within the field that have yet to gain wider academic attention.

Overall, Fig. 4 reflects a diverse landscape of fintech research across the globe. The citation count relative to the number of documents for each country provides insight into the research's relative influence and possibly its quality, with some countries demonstrating a higher influence per document than others.

3.3. Key journals

Table 1 shows a bibliometric analysis of various journals within the fintech field, delineating their scholarly output and impact through several key metrics. A detailed examination of the data is requisite to elucidate these publications' comparative academic stature and influence.

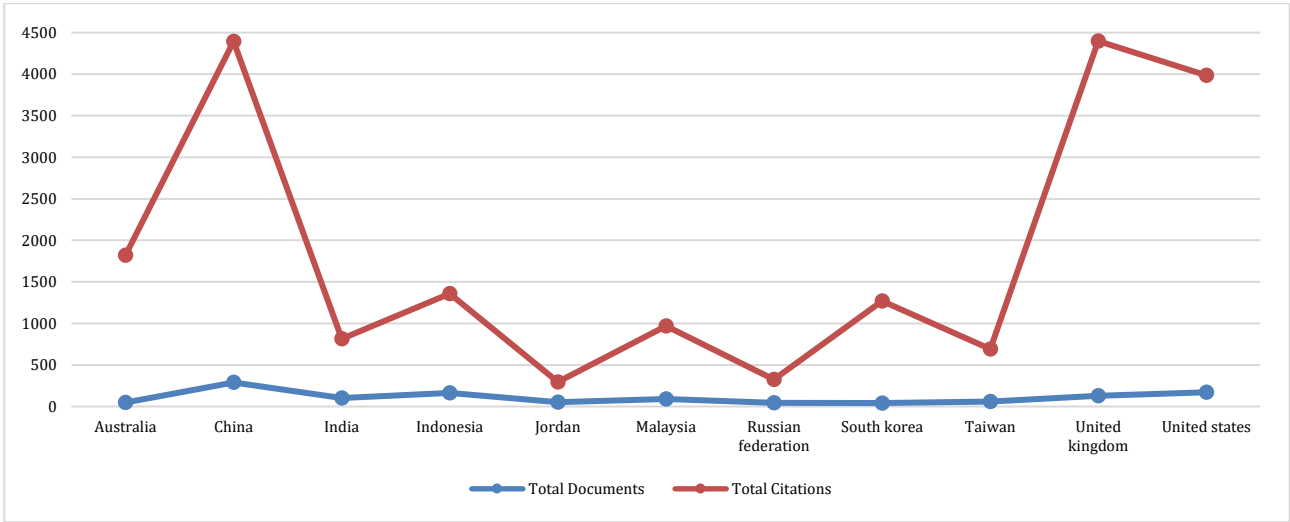


Fig. 3: Country-wise publications on fintech

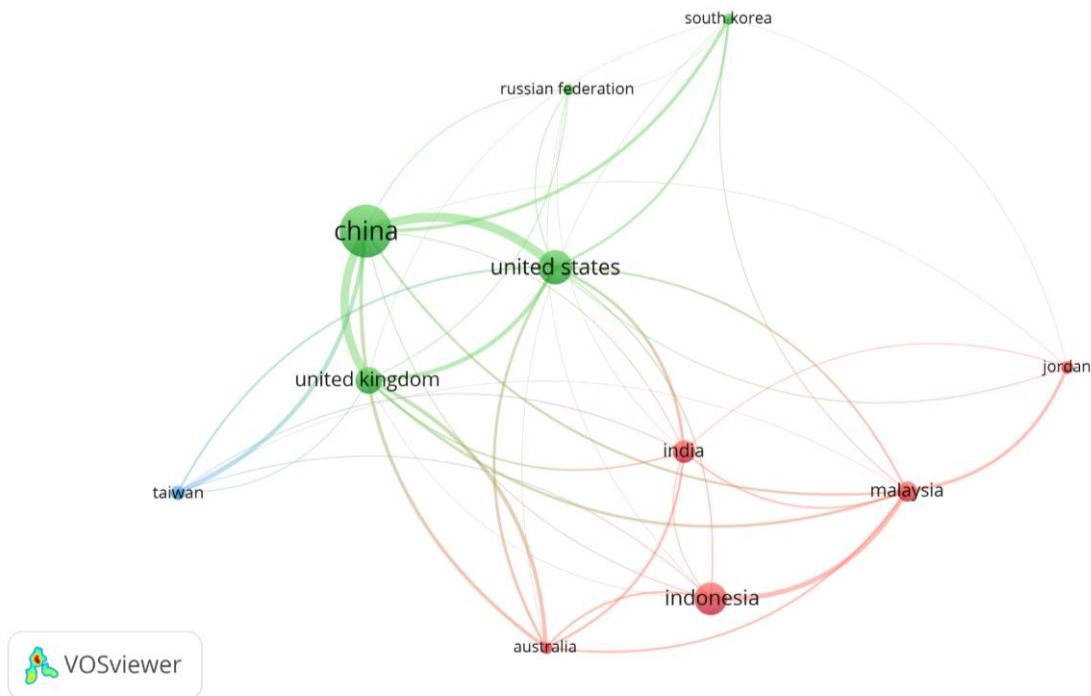


Fig. 4: Country-wise publications on fintech

Table 1: Top-most frequently cited sources

Journals	TP	TC	CPP	Cite Score	SNIP	SJR	Publisher
Cogent Economics and Finance	13	54	4.15385	2.4	1.109	0.379	Taylor and Francis
Environmental Science And Pollution Research	9	130	14.4444	7.9	1.214	0.944	Springer Nature
Finance Research Letters	14	347	24.7857	10.8	2.67	2.231	Elsevier
Financial Innovation	12	480	40	9.7	2.244	1.171	Springer Nature
Heliyon	9	108	12	5.6	1.332	0.609	Elsevier
IEEE Access	13	206	15.8462	9	1.422	0.926	IEEE
International Journal of Bank Marketing	13	213	16.3846	9.9	1.91	1.088	Emerald Publishing
International Journal of Data and Network Science	9	42	4.66667	3.8	1.072	0.372	Growing Science
Journal of Risk and Financial Management	15	125	8.33333	2.8	0.476	0.258	MDPI
Journal of Theoretical and Applied Information Technology	11	15	1.36364	1	0.298	0.165	Little Lion Scientific
Sustainability	36	626	17.3889	5.8	1.198	0.664	MDPI
Technological Forecasting and Social Change	19	742	39.0526	17.2	3.008	2.644	Elsevier

TP: Total publication; TC: Total citations; CPP: Citation per publication; SNIP: Source normalized impact per paper; SJR: SCImago Journal Rank

The journal "Sustainability" leads in Total Publications (TP) with 36 entries, a quantitative testament to its extensive contribution to the literature. However, its Citations Per Publication (CPP) at 17.3889, while substantial, does not eclipse the impact per article of its peers. Its SCImago Journal Rank (SJR) of 0.664 suggests it has a

significant, yet not dominant, position in the academic hierarchy.

In contrast, the "Technological Forecasting and Social Change" journal, with a CPP of 39.0526, demonstrates a pronounced academic influence, reinforced by a robust Source Normalized Impact per Paper (SNIP) of 3.008 and a high SJR of 2.644.

3.5. Occurrence of authors' network

In the dynamic field of fintech research, the contributions of individual authors can be multifaceted, as seen in the analysis of links, link

strengths, and citations from the provided data (Fig. 6). This comparison paints a vivid picture of how various authors have carved their niches and impacted the domain.

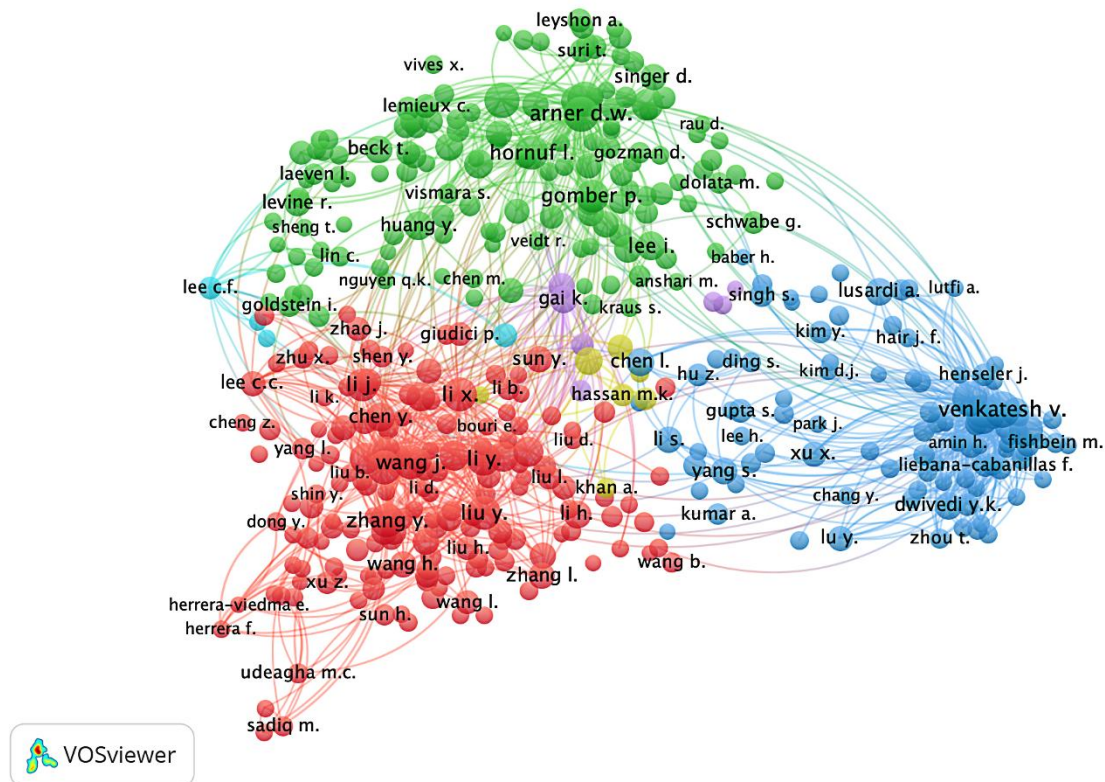


Fig. 6: A network of cooperation among the authors

At the forefront of network connectivity is Li X., who leads with the highest number of links, standing at 433. This extensive network indicates Li X.'s strong collaborative nature and suggests a broad engagement across various research areas and projects within fintech. On a similar note, Venkatesh V. demonstrates exceptional influence in terms of link strength, with a total score of 11,159. This high link strength signifies not just the quantity but the quality and impact of Venkatesh V.'s collaborations, pointing towards associations with significant or highly influential peers in the field. Such a strong network implies that Venkatesh V. is likely a central figure in the field, contributing to influential research and shaping the direction of fintech studies.

Citations are another crucial aspect, and here, Arner et al. (2022) led with a remarkable count of 278 citations. This high citation number is a testament to Arner et al. (2022) influential and widely recognized research contributions. It indicates the extent to which Arner et al. (2022) work has been acknowledged and built upon by other scholars, reflecting the author's pivotal role in advancing the body of knowledge in fintech. Citations are often seen as a direct reflection of an author's impact and recognition in the academic community, and Arner et al. (2022) leading position in this metric underscores their significant role in shaping research in the field.

Together, these metrics of links, link strengths, and citations highlight the diverse ways authors contribute to the field of fintech. Whether it's through extensive networking, influential collaborations, or impactful research contributions, each author plays a unique role in advancing the field. This analysis underscores the multifaceted nature of academic influence and the various ways in which researchers can leave their mark on a discipline.

The analysis of fintech research shows a spike in publications, with a peak of 475 in 2023, indicating continued interest. However, the shifting trend in total citations indicates that a more nuanced effect evaluation is required. The United Kingdom and the United States have the highest country-level impact, whereas China has a high output but modest influence. "Technological Forecasting and Social Change" stands out among publications because it emphasizes the value of nuanced knowledge. Keyword analysis revealed seven topic clusters, with 'fintech' taking the lead, emphasizing its vital importance. Author contributions vary, with Li X.'s broad network, Venkatesh V.'s high link strength, and Arner et al. (2022) leading citations demonstrating a wide range of influences. Comparing data from different analyses reveals interrelated patterns, which contributes to a more complete knowledge of fintech research dynamics.

4. Conclusion and limitations

This analysis provides an overview of the fintech research field, highlighting significant growth in the number of studies, the exploration of emerging technologies such as blockchain and AI, and the global distribution of research in response to innovations in financial services. The study identifies key contributors and suggests that collaborations across countries could enhance the diversity of innovations in this area. It also demonstrates a notable increase in interest in fintech over the past nine years, consistent with findings from other studies (Tepe et al., 2021; Li et al., 2021). For researchers, examining interdisciplinary interactions around core aspects of fintech could help develop more unified perspectives. Expanding such quantitative studies by using multiple databases, exploring broader metrics beyond citations, and employing alternative analytical methods could provide deeper insights into the field. As fintech adoption and capabilities continue to grow, ongoing empirical monitoring of scholarly activity can guide future research and practice.

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Compliance with ethical standards

Conflict of interest

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