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Emerging Risks, Fintech and Financial Sector Regulation: Performance Analysis, Science Mapping and Future Directions

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Abstract:

The study examined the scholarly output on the regulator`s response to emerging risks within the financial services sector. To attain this, a bibliometric approach was adopted that focused on performance and scientific mapping of the scholarly output. The data was retrieved from Scopus database covering the period 2016 to February 2026 resulting in 73 articles. The retreived articles were carefully screened using the Scientific Procedures and Rationales for Systematic Literature Review (SPAR-4-SLR) framework. Results were presented in terms of quantified annual scientific production, main authors, collaboration networks, and thematic research categories among others. The results indicate that regulatory response to emerging risks subject is growing evidenced by the number of annual publications, scholars and countries involved. Considerably, the scholarly research reflects very few collaborations who have played a critical influence in disseminating knowledge. Similarly, the results indicate a limited collaboration among countries, with institutional collaboration described as mainly locally concentrated. In conclusion, despite emerging risks, fintech is driving financial services transformation, with research mainly centred on financial regulation, artificial intelligence, blockchain, and digital financial ecosystems. Thus, the study provides evidence-based insights into fintech's increasingly complicated regulatory challenges for policymakers.

Keywords:

Emerging Risks, Financial Regulation, Central Bank, Fintech, Financial Services Sector, Artificial Intelligence, Blockchain.

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Introduction

Risk is not static but continues to evolve especially in the current dynamic operating environment for the financial service sector, the fintech era. With risk dynamism, regulations and policy should be in tandem. However, this is not the case due to lagging effect. The financial services sector continues to witness growth being driven by financial technology (fintech). Fintech has significantly transformed the financial services architecture, changing traditional banking intermediation and broadening access to financial services among others. Technological developments in digital platforms, artificial intelligence, and distributed ledger technologies have transformed the competitive landscape of the financial sector, concurrently presenting significant regulatory and governance issues (Ioannou, Wojcik & Urban, 2024; Arner et al., 2016; Zetzsche et al., 2020).

In terms of payment services, various fintech driven platforms have been developed marking a shift from traditional payment systems. These include among others Paypal, Google-pay, Apple-pay which facilitates cross border payment solution (Dagher2025), mobile based such as M-Pesa in Kenya revolutionising financial inclusion agenda (Kawamoto, Spers, Fleury, Feldmann, & Yoshida, 2023). Accordingly, to gain customers' trust and adoption, digital platforms should be secure and in compliance with regulations (Algubelli, 2025). Josyula (2025) argued that organizations should ensure regulatory compliance when making strategic technology investment decisions. Payment service providers need strategic alliances with industry players to manage related regulation issues. Furthermore, for any digital payment system a balance should be struck concerning regulation, technology advancement and risk (AllahRakha, Xamdamovna, Sokhibjonovich, Narziev, & Temurbek, 2025). Risk includes privacy, user rights and security while advancement focuses on industry shift and consumer acceptance recognising the regulation role.

Prior literature has revealed existence of research gaps. Firstly, fintech and firm-level applications mainly feature in research, however macro-financial implications, especially for policy, regulatory mandate, and risk remain limited (Ioannou et al., 2024). Secondly, although regulatory frameworks such as regtech have gained importance, the integration of fintech and policy-driven analysis remains incomplete, resulting in disconnected insights across several areas. Central banks are investigating the adoption of digital currencies, with pilot projects in Bahamas, China, Uruguay (Sethaput & Innet, 2023; Nanez Alonso, Jorge-Vazquez, Reier Forradellas, 2021). Accordingly, this illustrates the convergence of innovation and monetary policy with scant literature having examined the systemic implications.

Thirdly, literature gaps exist in conceptual integration among blockchain, artificial intelligence (AI), and digital finance ecosystems. Some of the prior studies, Subburayan, Sankarkumar, Singh, Mushi (2024) revealed the potential to transform financial services sector areas such as transaction security, risk management, customer satisfaction and operational efficiency. While Shakil, Ali, Illahi, & Ahmed (2025)

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concluded that by integrating these technological innovation concepts addresses regulatory mandates and risk management within the financial services sector. Thus, these concepts commonly evolve as independent research areas, thereby limiting a comprehensive understanding of fintech and implication to the financial system's structure.

It is against this background that this study seeks to address these gaps by conducting a bibliometric study on the emerging risks and financial services sector regulatory response in the fintech era. The research questions being RQ1: Which authors, journals, and countries have been the most productive in this research domain? RQ2: What are the key thematic trends in the literature on emerging risks and regulation in the fintech era? and RQ3: What future research directions, and practical implications can be derived from the existing literature? The findings will contribute to understanding of fintech as a transformation driver in global financial architecture.

Methods and Data

To gather the relevant articles and information, the Scientific Procedures and Rationales for Systematic Literature Review (SPAR-4-SLR) framework was adopted. Paul, Lim, O`Cass and Bresciani (2021) recommended this framework as it ensures transparency and credibility by following a set criterion. The SPAR-4-SLR has been widely used in bibliometric analysis. As shown in Figure 1, the framework follows three major processes which are assembling, arrangement and assessment. The three stages as applied to the study are explained below:

Assembling

In this stage, the domain of study was established by identifying the scope of study. The scope of study was identified as “Emerging risks in the fintech era and financial sector services regulatory response”. Data was gathered from Scopus database because they have strong indexing standards and is inter-disciplinary research database (Singh, Singh, Karmakar, Leta, & Mayr, 2021). The data base search period was January 2016 to March 2026.

To assist in gathering the relevant documents, the research`s key words were identified and limited to “title, abstract and keywords” column. The search query was as follows: TITLE-ABS-KEY (financial technology) OR TITLE-ABS-KEY (digital innovation) AND TITLE-ABS-KEY (risk) OR TITLE-ABS-KEY (emerging risk) AND TITLE-ABS-KEY (regulation) AND TITLE-ABS-KEY (financial services sector). Yadav & Chakrabarti (2022) observed that setting the criteria enhances data gathering process. This process resulted in 178 documents.

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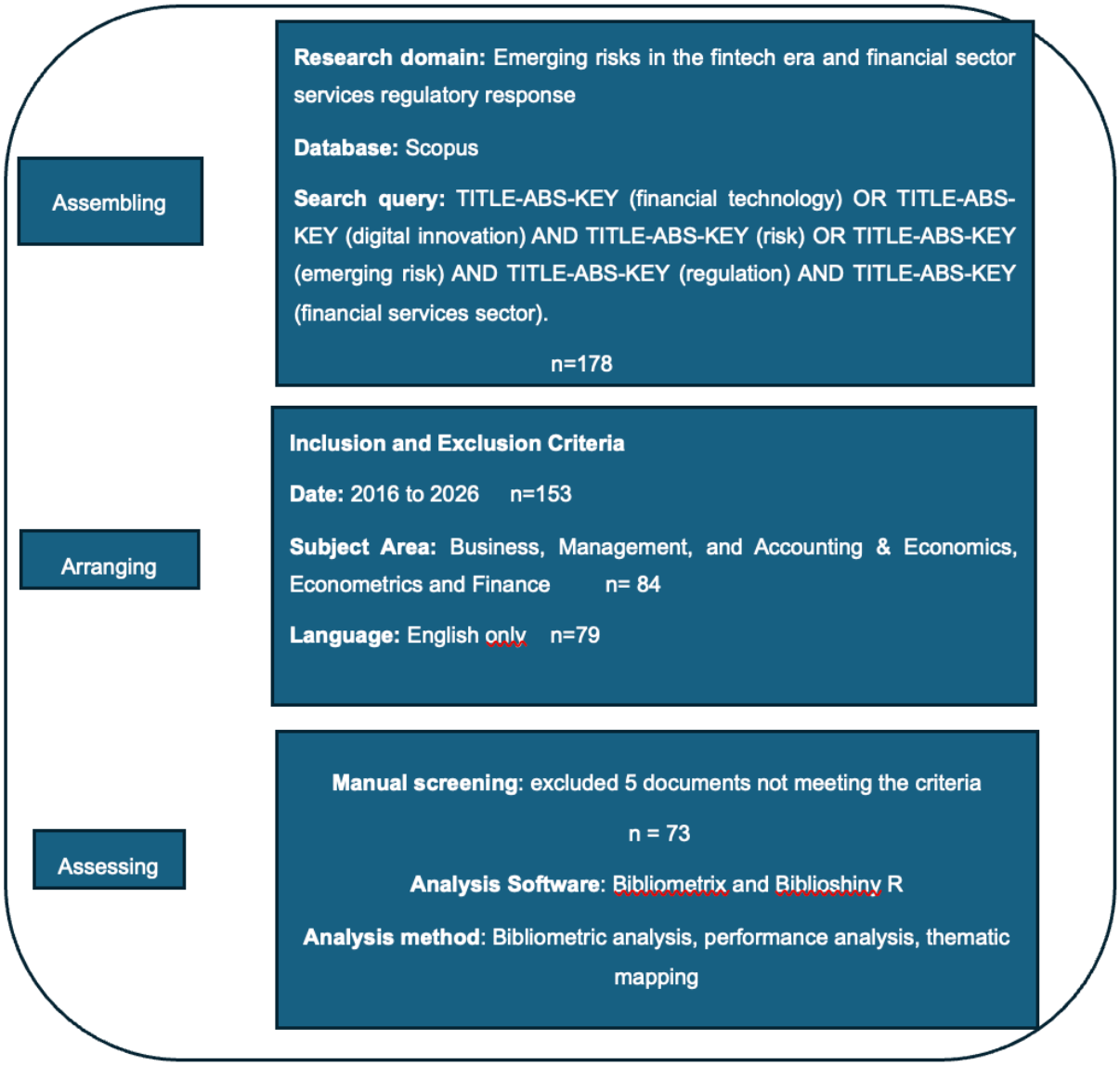


Figure 1: SPAR - 4-SLR for the study

Arranging

The documents were screened based on the inclusion and exclusion criterion. Firstly, the time frame for the documents was limited to January 2016 to March 2026, resulting in 153 documents. Secondly, the subject areas of the documents were limited to two namely Business, Management, and Accounting & Economics, Econometrics and Finance. This resulted in 84 documents. Limiting to these subject areas would enable gathering relevant information associated with the financial services sector. Finally, the

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documents language was limited to English only, which resulted in 79 documents. English is the dominant language and enables comparability of documents.

Assessing

The 79 documents were exported in CSV file format for further analysis. To check for completeness, five documents were manually removed as they belonged to other subject domains. For instance, Schneiders, Carvalho, and Spataru (2024) was on energy regulatory sandboxes while Chiriaco, Catellani, and Ciccullo (2025) was on drones and robots in Agriculture. The statistical software R was used with the packages Bibliometrix and Biblioshiny (Aria and Cuccurullo, 2017). This allows the use of different scientific mapping tools, the analysis of bibliographic information, and the visualization of the results.

Results and Discussion

Summarised Data Description

Timespan	2016:2026
Sources	68
Documents	73
Document Average Age	3.56
Authors	177
Authors of single-authored docs	18
Average citations per doc	18.79
International Co-Authorship	21.92%
Co-Authors per Doc	2.48
Author`s Keywords (DE)	266

Table 1: Summarized results

Table 1 shows the summarised results obtained from documents analysed. The results for the period from 2016 to 2026 reveal that there is a relatively small but consistent scholarly research, with 73 documents originating from 68 multiple sources. This shows that the publication environment is fragmented and that there are not many journals that focus on a particular subject.

There are 177 authors with an average of 2.48 co-authors per document, which shows a significant collaborative trend. Only 18 articles were single-authored. The percentage of international co-

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authorship, which is 21.92%, shows that there is some global engagement, but it also shows that there exists a demand for further cross-border research integration.

The average citation rate of 18.79 per document indicates that the existing literature still has a reasonable academic impact. Additionally, the fact that there are 266 author keywords shows that there is considerably subject scope. The average age of the documents is only 3.56 years, which shows that they are still relevant. However, the lack of reported references may indicate underlying data problems, necessitating careful interpretation of citation links. Overall, the evidence suggests that this study area is collaborative and has a moderate impact.

Performance mapping

This section answers RQ1: Which authors, journals, and countries have been the most productive in this research domain?

Annual academic publication

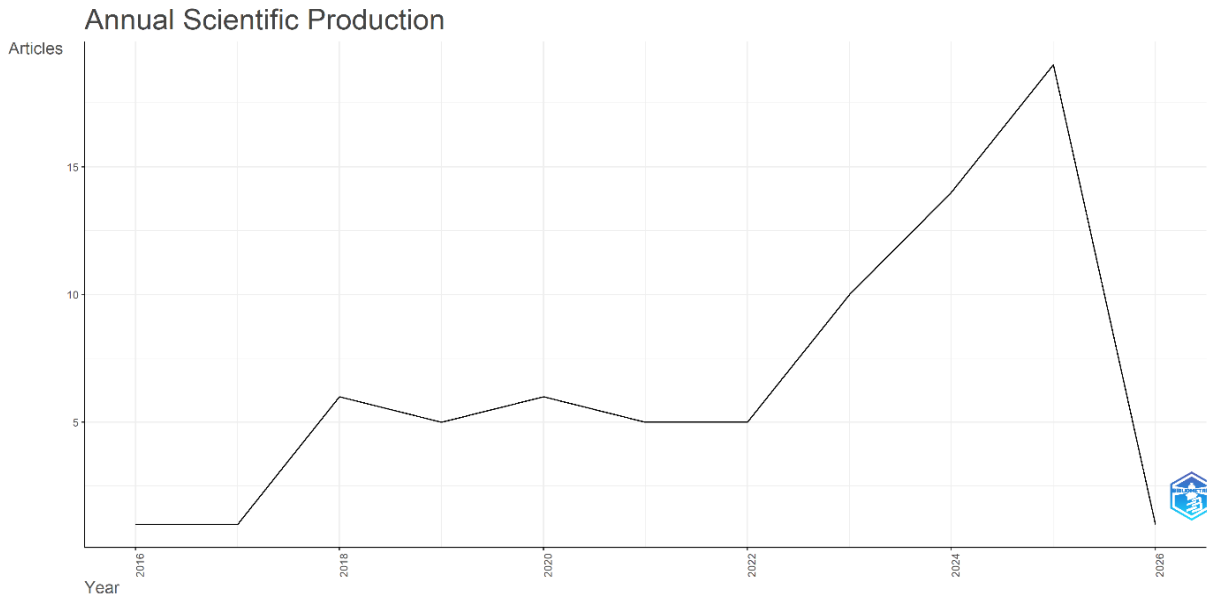


Figure 2: Scientific Production, 2016 to 2026

Figure 2 shows the scholarly output produced during the period 2016 to 2026. The results show that the highest articles of nineteen (19) were produced in 2025 with the lowest recorded in 2016 and 2017 which had one (1) article each. The increasing trend from 2022 could be attributed to focused scholarly attention after the COVID 19 pandemic, where there was growing interest in adoption of fintech products and increased digital uptake. The trend suggest transition from early stage to growth stage demonstrating scholarly growth. Also, the publications drop recorded in 2026 reflects the incomplete year considered for the study.

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Top Journals

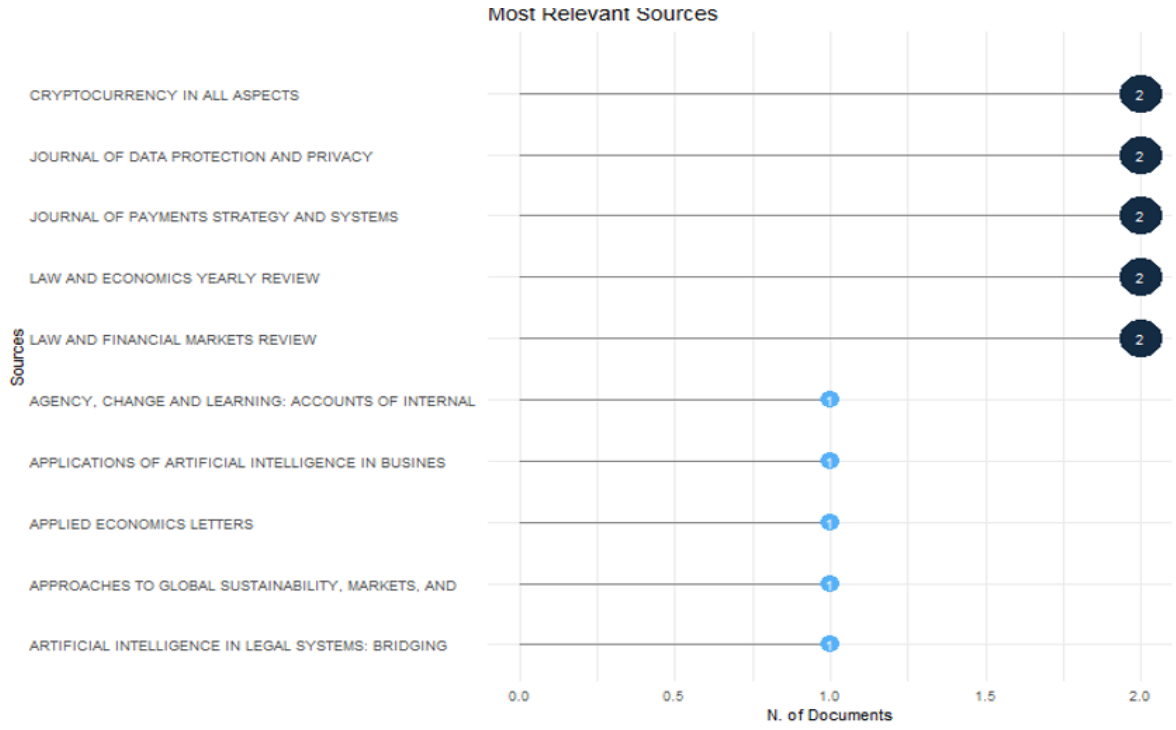


Figure 3: Top Journals published

Results in Figure 3 shows the top ten journals used in publishing the scholarly output for the subject domain under study. They revealed that 50% of the articles were published in the Law and Economics Yearly Review, Journal of Data Protection and Privacy, Law and Financial Markets Review, Journal of Payments Strategy and Systems, and Cryptocurrency in All Aspects. The publication was across different journals which covered various aspects within the financial services sector. They also indicate the diversity of the subject domain.

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Bradford law of productivity

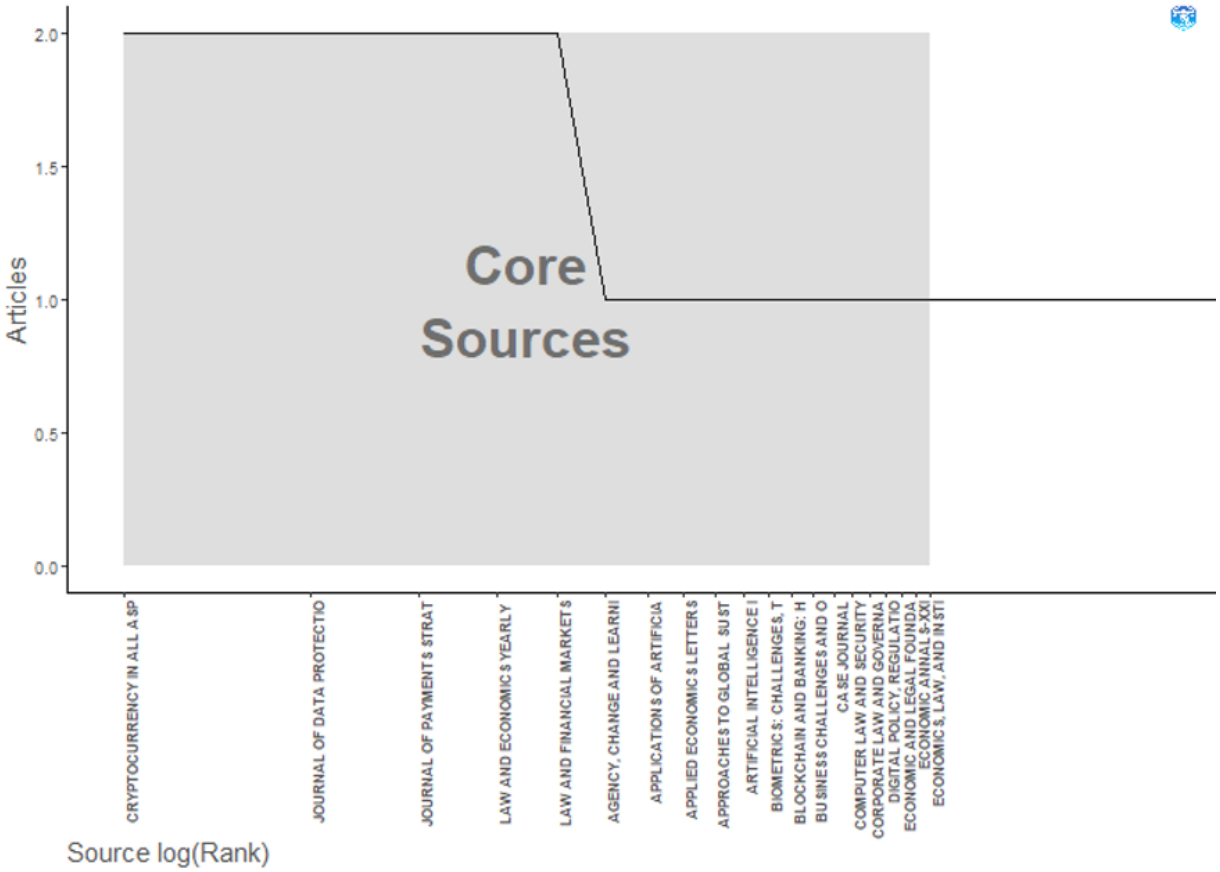


Figure 4: Journal ranking based on Bradford law

Figure 4 shows the journals ranked according to Bradford`s law. Bradford`s law is used to measure the journal`s relevance in the field of study. In this case, the journals were classified into three zones. Zone 1 refers to the core journals which are few but have highest productivity. As shown in Figure 4, Journals that classified into zone 1 were Law and Economics Yearly Review, Journal of Data Protection and Privacy, Law and Financial Markets Review, Journal of Payments Strategy and Systems, and Cryptocurrency in All Aspects.

Zone 2 reflects secondary journals with moderate productivity. These included Agency, Change and Learning; Applied Economics & Letters; Artificial Intelligence; and Fintech among others. Zone 3 being the highest journals with lowest productivity include Journal of Financial Crime and Financial Reporting. Thus, the core journals for the subject domain under study are those in Zone 1 which are across the disciplines of finance, law, economics and technology. They reflect the interdisciplinary nature of fintech related research with issues of innovation, regulation and risk moving beyond the academic discipline boundaries.

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Document by type

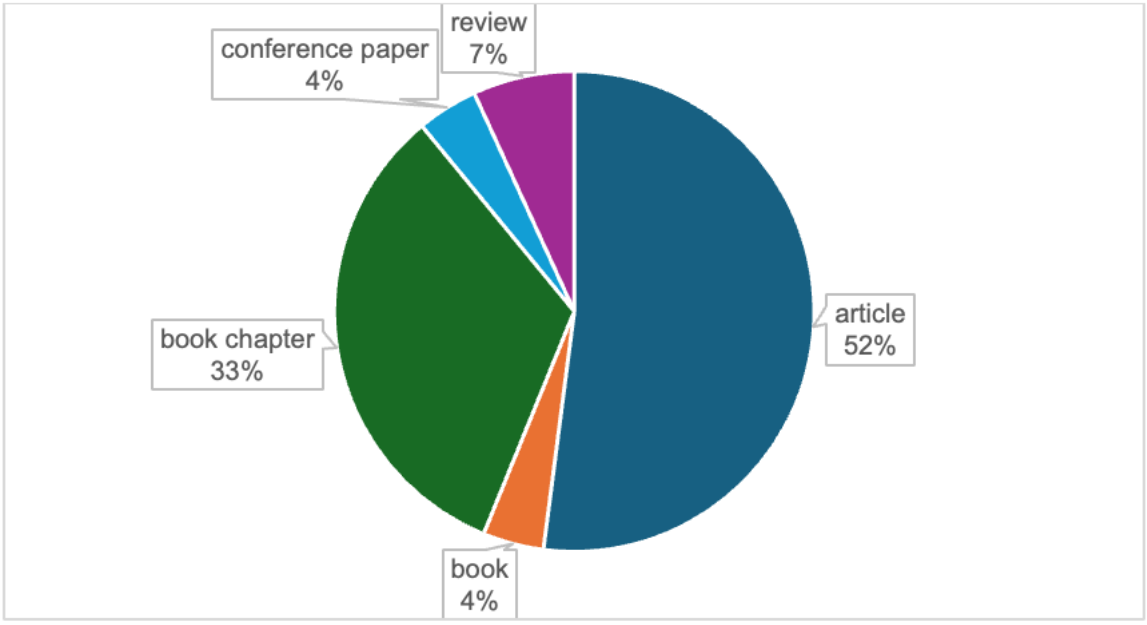


Figure 5: Publication by document type

Figure 5 illustrates the study`s identified documents by type. Of the documents, 52% were articles, 33% were book chapters,7% were review articles, 4% of apiece were conference papers and books. The publication type indicates the trend and preferences associated with researchers around the subject of emerging risks and regulatory responses within the financial services sector. Thus, the researchers prefer to publish in articles and book chapters as a way of disseminating knowledge and findings.

Top Authors by Output and Output Fractionalised

Author	Number of Articles	Output Fractionalised
Naheem MA	2	2
Abu Khaled MF	1	1
Mpofu FY	1	1
Arner DW	2	0.583
Buckley RP	2	0.583
Grima S	2	0.5

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Abdallah-OU-Moussa S	1	0.33
Abisheva M	1	0.33
Battanta L	1	0.25

Table 2: Author`s output and fractionalized

Table 2 shows the top authors and fractionalised output. In terms of the publications, Naheem MA, Arner DW, Buckley RP and Grima S were the highest with two publications each over the study period. However, by fractionalising the output, Naheem was the highest with 2 followed by Abu Khaled MF and Mpofu FY with 1. Arner DW and Buckley RP had 0.583 fractionalised output though they had higher article output of 2.

Stock, Reichmann, & Schlogl (2025) argue that reliance on publication output only may overestimate or underestimate individual scholars' output, while fractionalized metrics reflect scholarly contribution. Accordingly, the results in Table 1 show a core group of highly engaged scholars and a larger group of collaborative researchers. The highly engaged authors concerning this subject domain under study includes Naheem MA, Abu Khaled MF and Mpofu FY while Arner DW, Buckley RP, Grima S and Abisheva M among others were among the top scholars collaborating their contributions. Thus, the domain subject under study indicates few single author outputs and multiple collaborative research.

Author collaboration map

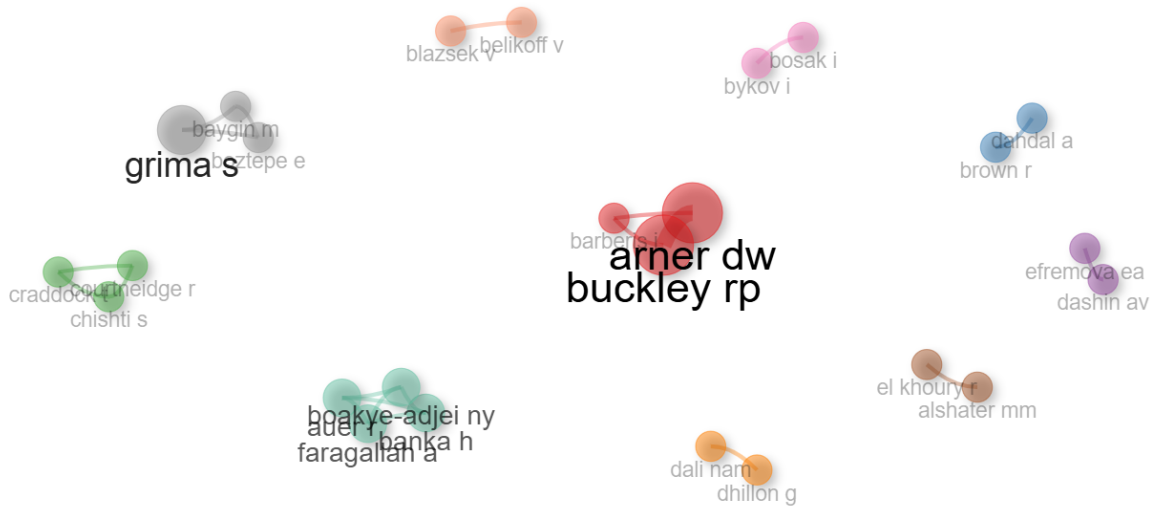


Figure 6: Collaboration network of top authors

Figure 6 reveals the authors` collaborations cluster map for the subject domain under study. It shows a few clusters with 2 to 3 nodes indicating collaborations with no cross global collaborations. When an

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author is in the middle of the cluster, their node size is bigger. These authors play a significant role in scholarly information engagements as they are considered prominent and influential within the field (Benameur, Hassanein, Mostafa, Elmaghrabi, Tharwat, 2025; Hassanein and Mostafa, 2023).

The most prominent cluster is visualized by bigger node which has Arner DW and Buckley RP. These remain as the key and influential authors within the subject under study and demonstrated by fractionalised output of 0.583 in Table 2. Grima S is the second influential cluster as reflected by the dark grey node. Notably they are independent from the cluster of Arner DW and Buckley RP which reflects a different subject dimension. The other influential clusters are few and scattered indicating niche and minor collaborations.

The above findings can be attributed to the growth patterns in related academic output and periodic differentiated collaborations. For growth patterns as shown in Figure 2, the research output increased from 2022 with the prior periods reflecting fluctuational growth. At the same time, Arner and Buckley were early collaborators in researching about fintech and regulatory issues during the period 2016 to 2021. Furthermore, the emerging generational authors` related output was recorded 2022 to 2026. For instance, Grima S collaborations were published in 2025 and Boakye were in 2023.

Top Author`s Country Publication Network

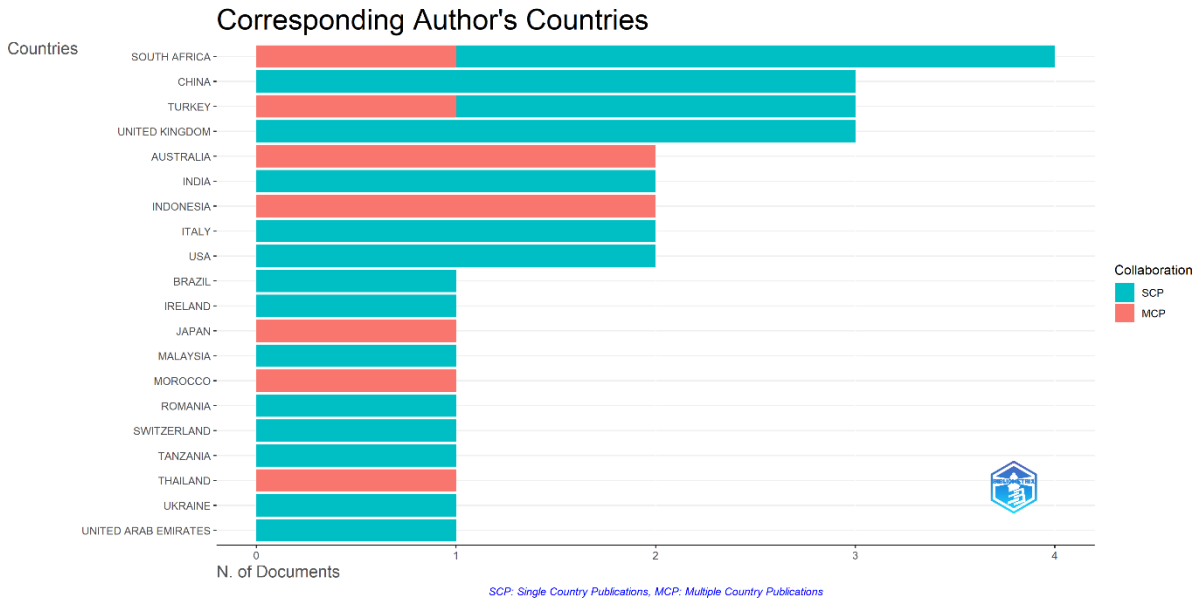


Figure 7: Corresponding Authors Distribution by Countries

Figure 7 shows the scholarly output based on single, multiple or both country publications. The results revealed a mixture of countries that have single country publications (SCP) only, multiple country publications (MCP) only and a combination of both. Of all the countries, 65% of the countries were

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observed to have SCP only. These countries include among others China, United Kingdom, India, Italy, USA and Brazil. For MCP only, 15% of the countries were observed namely Thailand, Morocco and Japan. Countries with both MCP and SCP accounted 20% which were South Africa and Türkiye.

The findings highlight different cross country collaboration patterns in the academic publication. China, United Kingdom, India, USA, Italy and Brazil where the countries were with SCP only which reflects domestic country research policy in advancing local knowledge and related policies. Countries such as UK, Italy, India and Brazil have an open academic policy which encourages collaboration while China is state-driven discouraging open intellectual engagements (Gaviyau & Godi, 2025; Sanjeev, 2025; Pringle & Woodman, 2022). The plausible explanation being since the subject area of fintech and regulation is emerging more research should be centred on providing well researched and customised policy solutions. Notably, these countries are the drivers of regulatory sandboxes (UK), regtech (UK, China and India), bigtech (USA and China), fintech (India).

On the other hand, countries such as Turkey and South Africa with both SCP and MCP display strong academic links in terms of international collaboration, reflecting their integration into global research systems. Jonathan Adams (2013) posits that international co-authorship is a key driver of research visibility and impact. However, the uneven collaboration distribution can contribute to disparities in network connectivity. Also, the results are based on the corresponding author`s affiliation which might not fully reflect the author`s quality contribution.

Geographical distribution of research output

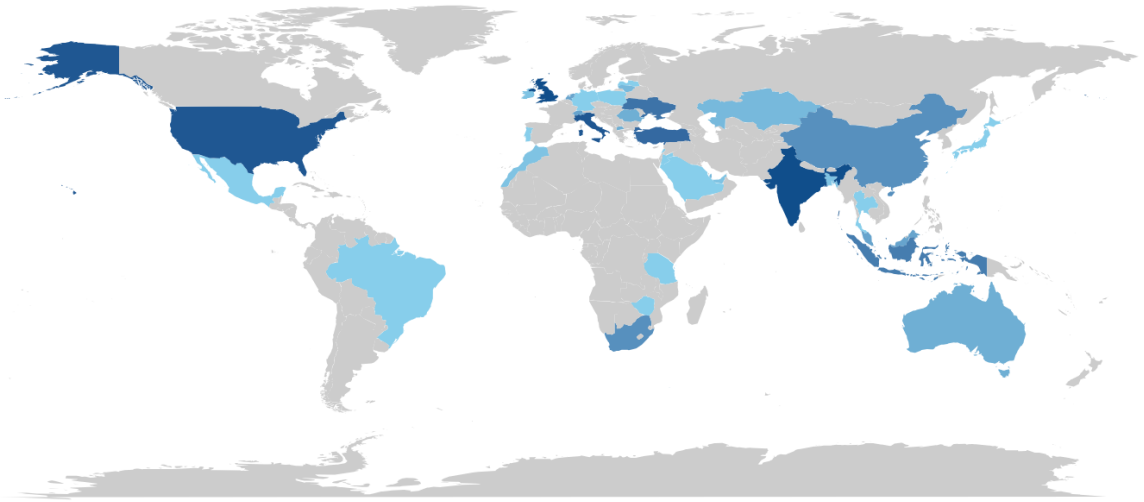


Figure 8: Global scientific production distribution

Figure 8 shows the geographical visualisation of the research output about fintech, emerging risks and regulatory response subject. Output is geographically dispersed with concentration in Asia, Europe,

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parts of Africa, Australia and America. This can be attributed to differences in country`s research capacity, fintech development and related regulatory approaches.

Scientific mapping

This section answers RQ2: What are the key thematic trends in the literature on emerging risks and regulation in the fintech era?

Keyword analysis



Figure 9: Study`s word cloud

Keyword analysis is an essential tool in bibliometric research, showing the most prominent terms in the subject (Pesta et al., 2018). A word cloud assists in summarizing and visualizes research article data. The design shows how often certain words are utilized by providing them a size and positioning them closer to the centre of the cloud. The size and position of each word in the cloud indicate its importance (Desalegn and Tangl, 2022). In particular, the word cloud highlights frequently used words which will be displayed more prominently compared to less frequently used words. Figure 9 shows the keywords extracted from the abstracts of articles under consideration in the form of word cloud. Evidently, the most common words are "fintech," "banking," financial regulation," “artificial intelligence," and "blockchain."

Co-occurrence analysis

Co-occurrence analysis is a bibliometric technique that examines the relationship between two occurrences in a study (Block, Fisch, & Rehan, 2020). This approach visualizes regularly used keywords

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and their extensive connections in publications on a certain subject of interest. The nodes represent keywords, the edges represent linkages, and the thickness and closeness of the edges and nodes show the frequency of co-occurring terms (Donthu et al., 2021).

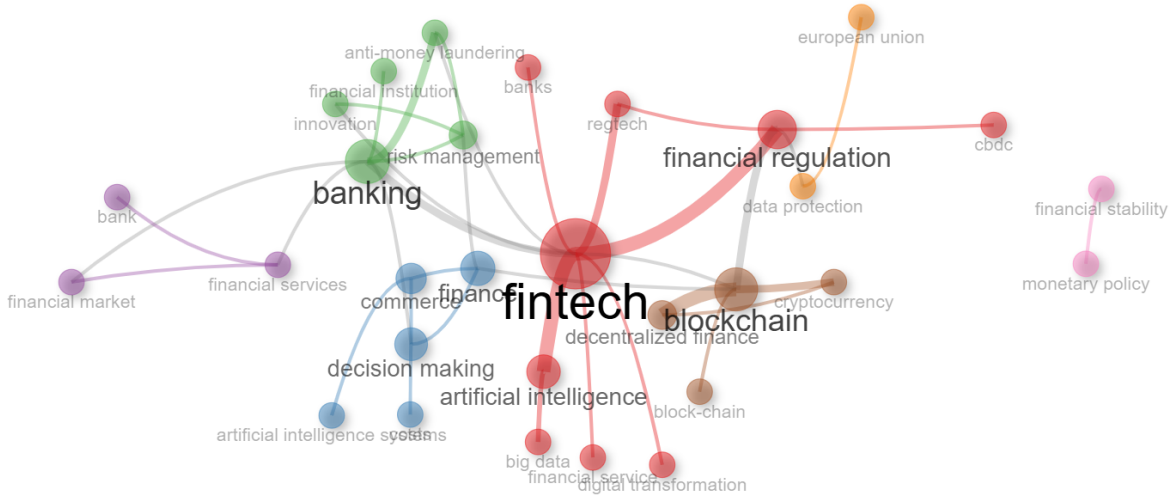


Figure 10: Co-occurrence of study`s keyword

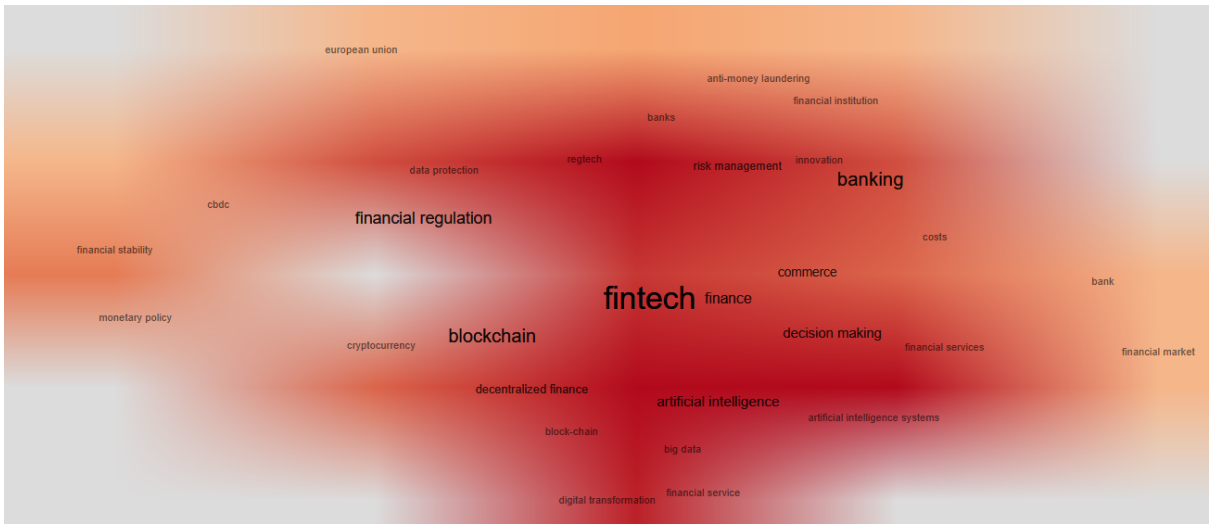


Figure 11: Density map of study`s keyword

As shown in figure 10, the co-occurrence reveals four cluster areas influencing the study while figure 11 shows the density maps of the themes. Firstly, fintech cluster is the mostly highly connected node which reveals it as the anchor of the study. This is strongly linked to financial regulation, blockchain, financial services artificial intelligence, innovation and finance. These findings indicate that fintech serves as the

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integrative link between financial services and innovations. Additionally, the density map reflects these themes as not only frequently studied but also strongly integrated within the literature.

Secondly, financial regulation is another dominant cluster which is connected to data protection, European union, central banking digital currency (cbdc) and RegTech. This cluster indicates regulatory and policy driven research that addresses risks such as compliance, and systematic risk. Thirdly, blockchain is another cluster which is linked to cryptocurrency and decentralised finance. This indicates technology driven research revealing the new and emerging financial architecture system. Notably, this cluster brings technology identity which closely links with fintech domain. Lastly, banking cluster, which is associated to banking, risk management, anti-money laundering and financial institutions. This reveals the existence of traditional banking system which is being integrated with fintech innovations, showing the shift towards digital banking and fintech solutions to banking.

The thematic and density analysis further validates the presence of a highly concentrated scholarly output centred on fintech and important connection to finance, banking, and financial regulation. The intensity of fintech reflects strong conceptual integration. Notably, adjacent to fintech are important but less densely connected themes, which function as critical to the central discourse. These are artificial intelligence, blockchain, and regulatory frameworks. In contrast, macro-financial and policy-oriented themes such as monetary policy and financial stability remain comparatively marginal. This highlights literature disparity and underscoring the necessity for integration between fintech and financial system dynamics.

Thematic mapping

Thematic maps depict the distribution of research themes in a subject area. The theme map was created by analysing titles, abstracts, and keywords to discover patterns and similarities (Benameur, Hassanein, Azzam, & Elzahar, 2023). Figure 12 shows the thematic map with four quadrants based on density and centrality. Density measures the effectiveness of theme development based on internal keyword associations. The second metric, centrality, evaluates theme prominence through external term linkages.

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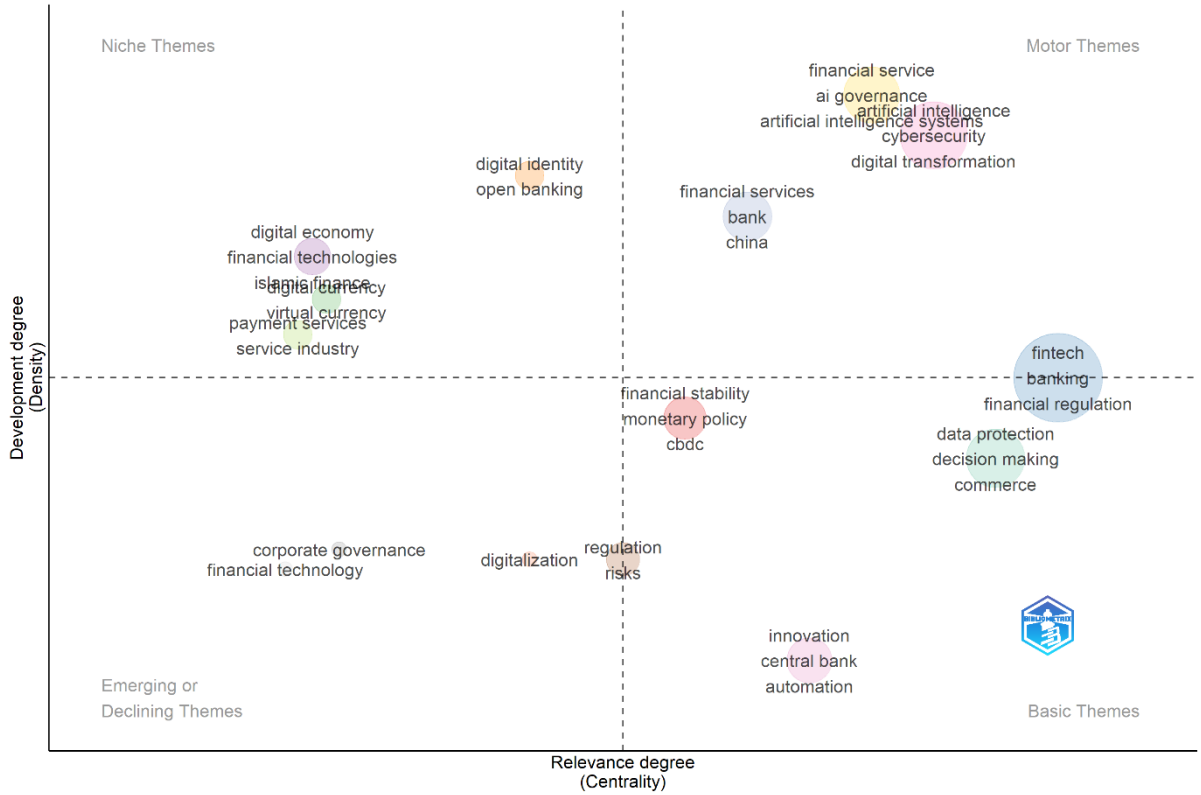


Figure 12: Study`s thematic mapping

The first quadrant, “motor themes,” refers to well developed and critical in the relevant research. These have high centrality and density. In this study, the themes identified were centred on financial services which is connected to bank and China, artificial intelligence systems and governance, cybersecurity, digital transformation and financial services. These themes indicate artificial intelligence and digital governance frameworks as central in shaping fintech and regulatory developments.

The second quadrant, basic themes which are foundational but still evolving. They have high centrality and low development. The theme has innovation, central bank, automation, data protection, decision making, commerce, financial stability, monetary policy, central bank digital currency, banking and regulation. The presence of central bank linked to innovation, monetary policy, central bank digital currency and financial stability indicates policy issues. Additionally, regulation and data protection presence indicate risk dimension which requires further research.

The third quadrant, niche theme, indicates well developed themes which are not well integrated into the research area under study. In this theme, there are issues of digital identity, open banking, digital economy, financial technologies, islamic finance, digital currency, virtual currency, and service industry. Accordingly, the specialised study areas such as Islamic finance and digital currency could be integrated into the fintech and regulatory risk scholarly output.

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The final quadrant, emerging or declining theme, represents themes that have low development and relevance to the study. They can either be emerging or declining areas these include areas such as corporate governance, financial technology, digitisation and risks. Thus, with the future being centred on fintech, these concepts can be considered as foundational and emerging.

The thematic mapping shows that fintech, financial regulation, and artificial intelligence are the conceptual basis of the research subject. However, core topics such as monetary policy, central banking, innovation, digital currency, and regulatory risk are underdeveloped, indicating important future research studies. Islamic finance and digital payment systems are peripheral but mature, while digital identity and open banking indicate the field's evolution toward more interconnected and digitally driven financial ecosystems.

Discussion of Results

Fintech has become the fundamental organizing concept in the study area, underpinning a highly interrelated literature on financial innovation, regulation, blockchain, and AI. This convergence is part of a dynamic shift in financial services toward technological integration into legal and regulatory frameworks (Arner et al., 2016; Zetzsche, 2020). The focus on data protection, regtech, and CBDCs highlights the policy-driven nature of the subject, as scholars and regulators address digital financial system difficulties and hazards (Vuković et al., 2025).

The analysis also shows major theme development disparities, particularly the inadequate integration of macro-financial issues like monetary policy and financial stability. Although conceptually central, these topics are underdeveloped compared to technology-focused clusters. This suggests a persistent gap between micro-level innovation and macro-level financial system analysis, supporting literature concerns that rapid fintech expansion may introduce new systemic risk if not aligned with regulatory and macroprudential frameworks (Ioannou et al., 2024; Wu et al., 2024). The presence of blockchain and AI clusters suggests that the sector is multi-technology driven, with multiple innovation streams growing at different integration levels.

A core periphery structure is also evident, with fintech, banking, and financial regulation forming an extensive intellectual body and niche and emergent subjects fragmenting. Islamic finance, digital payments, and service applications are thriving but disconnected from the broader discourse, while digital identity and open banking indicate the future of integrated, platform-based financial ecosystems. These findings indicate that conceptual integration across technological, regulatory, and macro-financial dimensions is needed to improve theoretical coherence and policy relevance.

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Implication of future studies

This answers research question RQ3: What future research directions, and practical implications can be derived from the existing literature?

The bibliometric analysis has revealed various gaps, thereby identifying future research pathways for the study.

Firstly, the bibliometric analysis revealed that most studies originated from single countries with limited international collaboration. Additionally, the collaboration is concentrated at local country level than international level. This underlines how crucial; it is to advance global collaboration in emerging risk and regulation research. For future research, it is recommended to promote and facilitate improved collaboration among authors from various geographic locations. Working together allows authors from different origins and places to share their experiences and perspectives.

Secondly, bibliometric and thematic analysis identify core, emergent, and undeveloped topics, bridging a significant gap in research that often ignores technological innovation and regulatory challenges. The study emphasises the need for an integrated approach that considers fintech risks within financial services sector, especially in the context of rapidly evolving digital financial services.

Conclusion

This bibliometric analysis, “Emerging risks in the fintech era and financial sector services regulatory response,” examined the evolution, structure, and theme direction of fintech innovation and regulatory framework research. The findings revealed that fintech is driving financial services transformation, with research mainly centred on financial regulation, artificial intelligence, blockchain, and digital financial ecosystems. Furthermore, convergence of the fintech and banking highlights a shift towards an integrated digital banking system. This requires a coordinated approach by central banks through regional banking platforms to develop cross border regulatory frameworks which enhances innovation and ensuring financial stability. The analysis also shows that fintech developments are researched more than their associated risks and macro-financial implications, such as financial stability, regulatory mandates, and risk.

Theoretical implications

This study maps and synthesizes dispersed research outputs into a coherent framework that links fintech innovation with evolving risks, and regulatory responses, contributing to academic literature. Bibliometric and thematic analysis identify core, emergent, and undeveloped topics, bridging a significant gap in research that often ignores technological innovation and regulatory challenges. The

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study emphasises the need for an integrated approach that considers fintech risks within financial services sector, especially in the context of rapidly evolving digital financial services.

Practical Implications

The study provides evidence-based insights into fintech's increasingly complicated regulatory challenges for policymakers. Data protection, regtech, and CBDCs highlight the need for flexible, risk-based, and proactive regulatory frameworks. The findings show that regulators and central banks must establish proactive methods to address cyber threats, operational vulnerabilities, and regulatory arbitrage. This is crucial given the growth of mobile money platforms like M-Pesa and decentralized financial systems like Bitcoin, which challenge traditional regulations.

In a digitized and interconnected financial ecosystem, financial institutions and fintech startups must develop risk management, compliance, and governance frameworks. Advanced technologies like artificial intelligence and blockchain require innovation, governance, and accountability in financial services. The study enhances understanding of fintech risks and emphasizes the need to align technological progress with strong regulatory responses to ensure financial stability, consumer protection, and sustainable financial sector growth.

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