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Navigating the Digital Wave: Mapping the Research Trends of Digital Finance (Fintech) Through a Bibliometric Lens

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Abstract*— In the wake of swift digitalization and technological progress, individuals worldwide have embraced the notion of digital finance. While academic literature has extensively explored various facets of financial digitalization, there remains a scarcity of research examining these services through a bibliometric lens. Thus, this study endeavours to provide a bibliometric analysis of adoption of digital finance, drawing insights from the Scopus database's literature review spanning from 2003 to 2023. The charts are directly extracted form scoups Analysis tab but for visualization VOSviewer software is used. The results highlight a dynamic and collaborative research environment with global impact, featuring diverse contributions from different countries and individuals in the evolving field of Financial Technology and Digital Money Publications. China has taken a lead with approximately 1400 publications, reflecting its substantial role in contributing to the field. However, recent collaborations, though fewer in number, have emerged from Pakistan and Malaysia, signifying diverse contributions .A significant portion of research, 20.1%, is categorized under Computer Science, showcasing the interdisciplinary nature of the field. "Sustainability Switzerland" stands out as a preeminent journal, housing 118 documents in the Scopus database, and is a prominent choice for collaboration among authors, alongside "Finance Research Letters. Asian educational institutions dominate the institutional landscape in terms of publication count, indicating a strong commitment to advancing research. Individual contributions are also notable, with "Rabbani" emerging as a foremost author, contributing 20 documents to the Scopus database.

***Keywords*— Digital Finance, Financial Technology (Fintech), Digital Money, Biblometric Analysis, Scoups Database**

I. INTRODUCTION

The financial sector has undergone continual advancements in service provision due to the process of digitization (Chang et al., 2023). This progress is characterized by enhanced communication and improved information processing in both client-facing interactions and backend operations. Recently, the focus on digitization has shifted from merely improving traditional tasks to creating new employment opportunities and innovative business models for financial service firms (Sanga & Aziakpono, 2023; Abbasi & Weigand, 2017). Digital finance, also known as financial digitalization, denotes the incorporation of digital technologies into the financial domain to enhance services and processes (Zou et al., 2023). This integration involves the utilization of technologies such as artificial intelligence, big data, biometrics, and distributed ledger technologies like block-chains. Digitalization of Finance is synonymous with Financial Technology (Fintech) or Digital Money. The objective of digital finance is to elevate the efficiency, speed, and security of financial transactions and services (Obinne Ugwuanyi et al., 2020).

In response, research in finance and information systems has begun scrutinizing these changes and their impact on digital development within the financial sector. Financial technology has swiftly gained attention due to its capacity to revolutionize supply chain

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networks across various business sectors. Financial Technology services have significant potential to deliver affordable, convenient, and secure banking services to individuals in Emerging Economies (Abad-Segura et al., 2020). Digital financial inclusion fosters seamless connectivity among participants in economic activities.

Innovative financing solutions, underpinned by new business models and technological concepts, form the basis for achieving sustainable performance through the dynamic capacities of businesses (Hinson et al., 2019). The burgeoning impact of digitalization on the financial services sector has brought financial technology and the newer "Fintech" topics into sharper focus (Pandey et al., 2024; Said, 2019). Information plays a pivotal role in financial services, evident in procedures like online trading (Donthu et al., 2021; Srivastava, 2015). To accommodate the ongoing transformation of the value chain, widespread and substantial digitization is necessary for both financial service providers and customers. In the digital era, fintech applications have redefined the traditional product-centric approach, embracing emerging ecosystems (Ibrahim & Nurmandi, 2023; Khera et al., 2021). Traditional channels may become obsolete as financial service designers concentrate on hybrid and adaptable modes of interaction-based consumer operations (Giglio, 2021; Ellegaard, 2018; Faccia et al., 2020). Yet, discussions persist on the emerging trends in fintech development, including issues such as moral hazard, loan defaults, and information asymmetry.

While numerous studies have explored Financial Digitalization, the research in this area concerning Bibliometric Analysis is relatively recent. Remarkably, only one published article, submitted on October 16, 2021, titled "A Bibliometric Analysis of Fintech Trends and Digital Finance" (Brika, 2022), closely aligns with our ongoing research. Notably, the author of that paper conducted the analysis on 343 finalized articles in the ScienceDirect database. To enhance the novelty of our approach, we extended the time frame until the end of 2023 on the Scopus database. This extended analysis revealed intriguing facts, particularly the notable increase in publications after 2021.

Research Questions

1. How have patterns in Digital Finance research developed over the last twenty years?
2. Identify the leading nations, primary subject areas, distinguished journals making noteworthy contributions to the publications of Financial Technology over a span of previous 20 years?
3. What are the patterns for collaboration among different countries and journals in terms of fintech publications?
4. Which researchers have significantly contributed & what is the strength of co-authorship to publications in the field of Financial Technology in the last 20 years?

II. ORIGINS OF BIBLIOMETRIC ANALYSIS

The term "bibliometrics" was initially coined in December 1969 by Pritchart in the USA, who published an article titled 'Bibliometric Description' (Broadus, 1987). Since then, numerous researchers have provided various definitions for bibliometric analysis, and a few examples are outlined below:

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Table 1: *Definitions of Biblometric Analysis*

Sr#	Author & year	Definition
1	McBurney & Novak (2002)	Bibliometric analysis is the quantitative study of publication patterns, encompassing both descriptive aspects, such as tracking an organization's article count, and evaluative dimensions, like assessing the influence of articles through citation analysis on subsequent research.
2	Donthu et al., (2021)	Bibliometric analysis is a method for rigorously exploring and analyzing large volumes of scientific data, providing insights into the evolutionary dynamics and emerging areas of a specific field
3	Alsharif (2020)	Examining and scrutinizing diverse aspects of written documents, bibliometric analysis essentially involves the evaluation of published units.
4	Ellegaard (2018)	Bibliometrics is a versatile analytical tool applied in diverse contexts, spanning traditional citation impact measurements to identifying environmental pollutants.

Researchers unanimously concur that bibliometric analysis entails the quantitative examination of publications. Put differently, bibliometric research delves into the formal characteristics of a specific knowledge domain by employing statistical and mathematical methodologies.

III. METHODOLOGY

The first step in conducting this bibliometric analysis involved systematically collecting relevant scholarly literature. This was achieved through comprehensive searches across Scopus databases (Manta et al., 2018). The search strings were carefully crafted to capture a wide spectrum of publications addressing the intersection of Digitalization and Finance. To ensure the relevance and reliability of the collected data, following set of inclusion & Exclusion criteria was established.

Table 2: *Parameters of Inclusion & Exclusions*

Criteria	**Inclusion**	**Exclusion**
Time Period	2003 to 2023	Before 2003 & After 2023
Language of Document	English	Other Languages
Document Type	-Journal Article -Conference Proceedings -Review Article	Other type
Source Type	-Journal -Conference Proceeding -Trade Publication	Other type

Only peer-reviewed journal articles, conference proceedings, and review articles were considered for inclusion. Additionally, only journals, conference proceeding trade publications was included. The time frame for inclusion was set from 2003 to 2023, allowing for a comprehensive examination of trends of publications (Sangwan et al., 2020). Lastly, publications were required to be in English, reflecting the dominant language of academic discourse in this field (Ergas & Hadar, 2019)

In phase one, the researcher used comprehensive keywords regarding the publication of Finance as a digital platform. Here is the advance query from scoups; TITLE-ABS-KEY(("Digital Finance" OR "Digital Money" OR "Fintech" OR "Financial Technology")), this resulted as 7,563 documents in the database, limiting this query to time frame of 2003 to

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2023, we found 7,376 documents. In phase two, the researcher focused on detail limitations w.r.t to language, document type and source type. This has been done using the advance query from coups as; TITLE-ABS-KEY(("Digital Finance" OR "Digital Money" OR "Fintech" OR "Financial Technology")) AND PUBYEAR>2002 AND PUBYEAR<2024 AND (LIMIT-TO(DOCTYPE, "ar") OR LIMIT-TO(DOCTYPE, "cp") OR LIMIT-TO(DOCTYPE, "re")) AND (LIMIT-TO(SRCTYPE, "j") OR LIMIT-TO(SRCTYPE, "p") OR LIMIT-TO(SRCTYPE, "d")) AND (LIMIT-TO(LANGUAGE, "English")), this resulted as 5642 final set of documents.

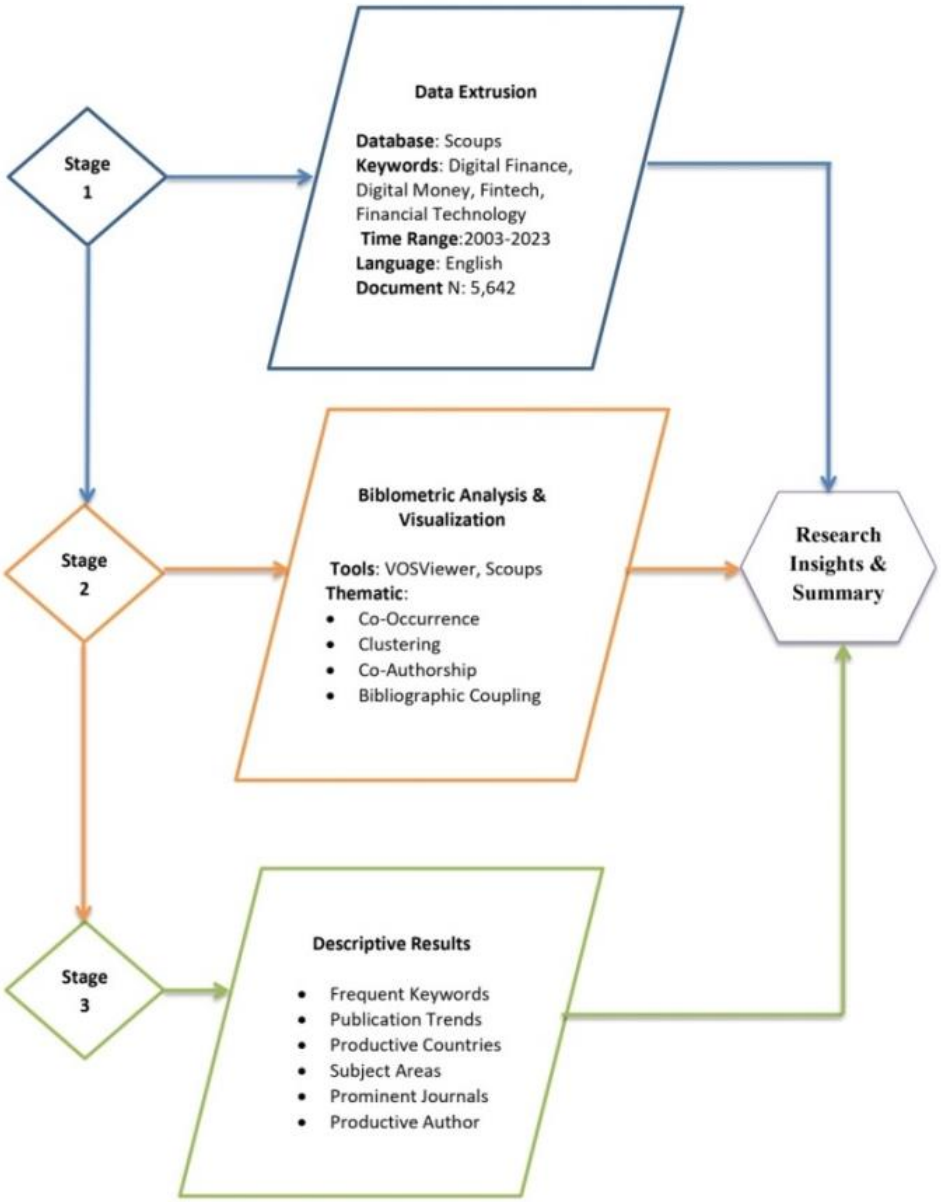

Figure 1: *Conceptual Frame Work*

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For each identified publication, pertinent bibliographic details were gathered, including the title, authorship, publication year, source (journal/conference/book), keywords, and abstract (Aggarwal & Wang, 2011; De Rezende et al., 2018; Lee, Jung, & Song, 2016; Mallik & Mandal, 2014). Additionally, citation counts were recorded to facilitate the assessment of the impact and influence of individual works (Tomaszewski, 2023; Gilyarevskii et al., 2022). The amassed data underwent a series of quantitative analyses utilizing Vosviewer. Critical bibliometric indicators, such as temporal publication trends, authorship structures, citation frequencies, and keyword co-occurrences, were visually represented in the form of a word cloud. These metrics played a pivotal role in pinpointing influential authors, seminal works, and prevailing research themes within the domain. To unveil relationships and connections within the literature, network analysis techniques were applied. Co-authorship networks were formulated to visually depict collaborations among researchers, while keyword co-occurrence networks were established to highlight clusters of interconnected research topics.

The qualitative facet of the analysis involved a thematic synthesis of the extracted keywords and abstracts, facilitating the identification of recurring themes, emerging research areas, and notable gaps in the existing literature (Newington et al., 2021; Zygouri et al., 2021; Halvorsen et al., 2020). To ensure data reliability and analytical robustness, a second researcher cross-verified a random sample of publications. Any discrepancies or uncertainties were resolved through discussion and consensus (Sharma et al., 2021; Mahanty, 2021). This study strictly adhered to ethical guidelines governing academic research. All data collected and utilized in the analysis were sourced from publicly accessible academic publications, and no personal or sensitive information was involved.

The bibliometric analysis predominantly focuses on author or citation information, assessing their intellectual flow and most significant publications (Feeley, 2008; Calero-Medina & Noyons, 2008). Furthermore, proper citation and acknowledgment protocols were adhered to, respecting the intellectual property rights of authors and publishers (Perez et al., 2023; Praja et al., 2023). Employing this rigorous methodology, this bibliometric analysis aims to offer a comprehensive and impartial overview of the scholarly discourse surrounding Fintech or digital money. The amalgamation of quantitative and qualitative analyses provides a nuanced understanding of the field, paving the way for well-informed insights and future research directions (Pellegrino, 2023; Hoang et al., 2023; Kim et al., 2021).

IV. ANALYSIS & DISCUSSION

The bibliometric investigation carried out on the subject of "Mapping the Research Trends of Digital Finance through a Bibliometric Lens" involved an exhaustive scrutiny of academic papers, literature, and conference materials sourced from Scopus databases. The examination aimed to unveil prominent patterns, noteworthy authors, and the progression of research within this field across different periods.

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Top 50 Key-Words Occurrence Analysis

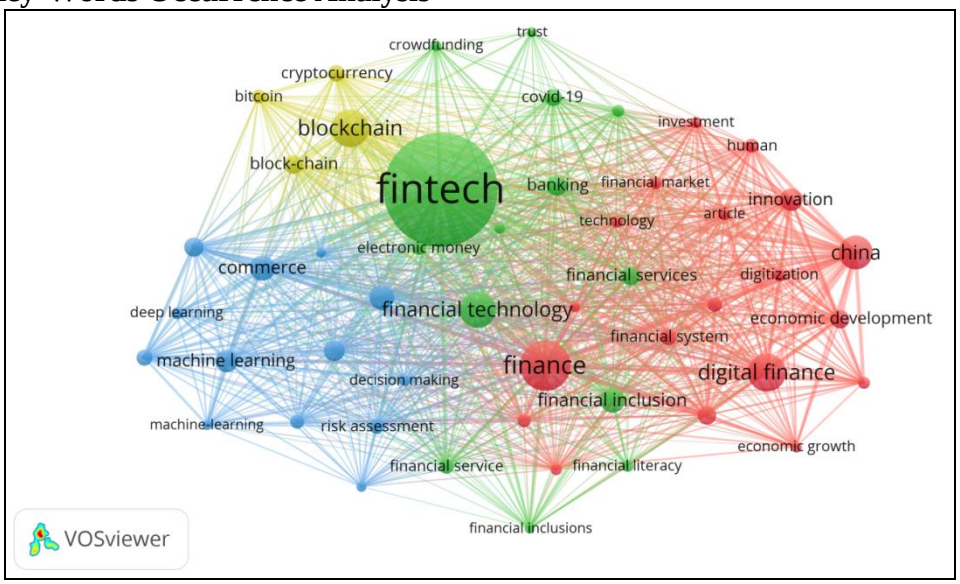

Figure 2: *Top 50 Keywords Patterns*

Type of analysis: Co-occurrence
Unit of Analysis: All keywords
Counting Method: Full Counting
Minimum number of occurrences of a keyword: 64

The network of keyword occurrences serves as an insightful reflection of prevailing research trends within a specific domain, delineating study hotspots (Zou et al., 2018). Similar analytical approaches are deployed to discern frequently used phrases or words in paper titles or lists of keywords, contributing to the discourse on keywords, thereby enhancing the understanding of the construction of a particular field of study. Furthermore, keywords unveil the intellectual core of the content.

The VOSviewer analysis results unveil a total of 14,594 keywords in all articles related to fintech or financial digitalization. Employing a minimum keyword occurrence threshold of 5, this criterion is met by 1193 keywords. To highlight the most trending keywords, the minimum occurrence threshold is elevated to 64, leading to the identification of 50 keywords from the overall pool. As depicted in Figure 1, VOSviewer categorizes the top 50 keywords into four clusters, each represented by a distinct color: red for Cluster (1), green for Cluster (2), blue for Cluster (3), and yellow for Cluster (4). The Digitalization of Finance, a primary focus of the study, emerges as a significant node in both Cluster (1) and Cluster (2).

Upon closer examination of the clusters, it becomes evident that nodes (keywords) within each cluster exhibit strong interrelations within the map's structure. The frequency rates of keywords in each cluster offer insights into the focal points of previously conducted studies. For instance, Cluster I (red) centers around Digital Finance (19 items), Cluster II (green) highlights Fintech (14 items), Cluster III focuses on Blockchain data processing with 13 items, and Cluster IV (blue) revolves around fundamental technologies essential for fintech, such as machine-learning and deep-learning (4 items). Each cluster signifies a notable research trend in the field of Financial Technology, portraying distinctive research streams based on its connection with keywords within the cluster.

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Table 3: *Decomposition of Clusters with Frequency of Keywords (Top 4)*

Cluster	Keyword	Occurrences (Frequency)	Total Linkage Strength
Cluster#1	Finance	555	1713
	Digital Finance	382	840
	China	327	1121
	Investment	209	757
Cluster#2	Fintech	1672	2692
	Financial Technology	350	635
	Financial Inclusion	212	455
	Banking	165	474
Cluster#3	Commerce	219	716
	Machine Learning	188	549
	Artificial Intelligence	176	457
	Forecasting	118	425
Cluster#4	Blockchain	265	681
	Ctyptocurrency	123	281
	Bitcoin	103	254

Yearly Increasing Trend of Digital Finance Publications

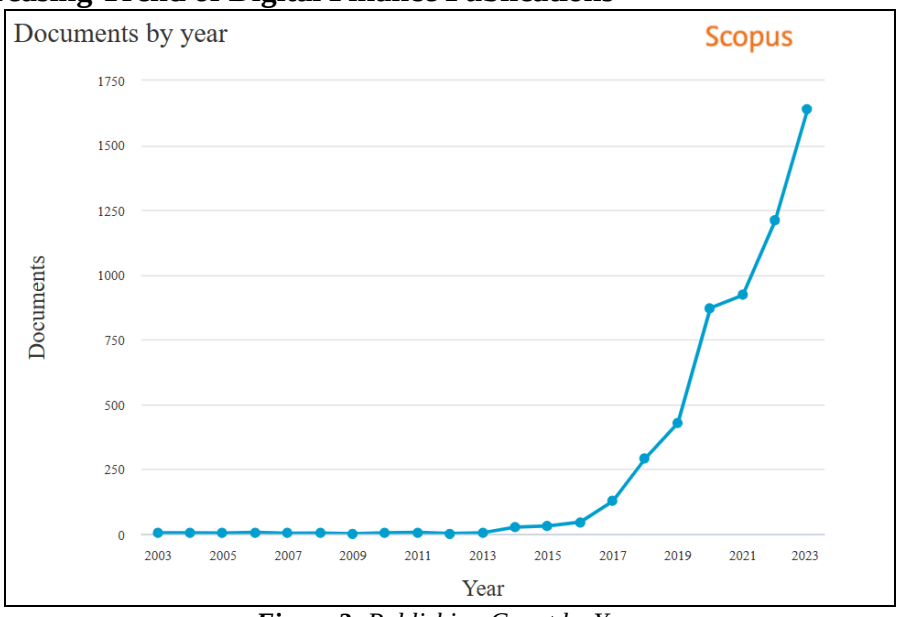

Figure 3: *Publishing Count by Year*

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Figures 3 illustrate the chronological progression of research within the domain of " Digital Finance or Fintech" scrutinized through bibliometric methodologies. From 2003 to 2013 the topic of financial digitalization was remained approximately un-address. After 2013, the number of publications started increased slowly. In 2018 the number of publications in the domain of digital money was around 300. Surprisingly from 2019 to onwards the research focus on paper free money started rising dramatically. This might be due to the fact of rising cases of COVID-19, as during pandemic mostly services in all domain started to provide online. However, the pace of publications keeps increasing, and by the end of the year 2023, the number of published documents reached its highest recorded point compared to the previous time frame. Observing the previous trend, it may be expected to continue to publish documents in the same manner in future.

Pioneering Nations in Financial Digitalization Research

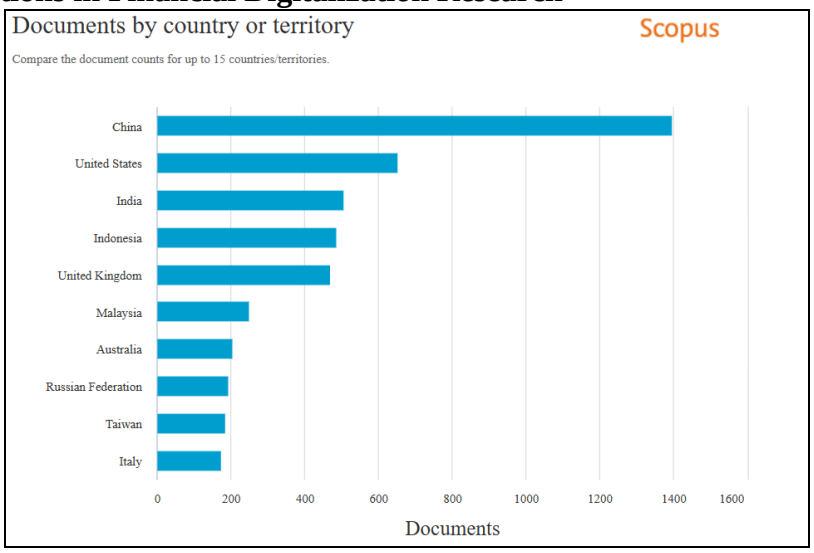

***Figure 4**: Most Prominent Countries by Number of Publication*

Figures 4 reveal an uneven distribution of research on the intersection of Financial Digitalization and Financial Technology across the globe. China leads with a significant approximately 1400 publications on this subject. Following closely is the United States, demonstrating substantial research interest with approximately 650 publications. Indonesia also makes a noteworthy contribution to this field, with around 440 publications. In contrast, the Malaysia has a comparatively modest impact, adding about 220 documents to the body of research in this area. This distribution underscores the influential role played by world in discussions about digitalization in handling money. Additionally, there is a noticeable research gap in the domain of financial digitalization in other regions, particularly those in Middle Europe.

To know the strength of mutual collaboration of research in the area of digital money among top countries, we performed the thematic analysis and extracted the following clusters.

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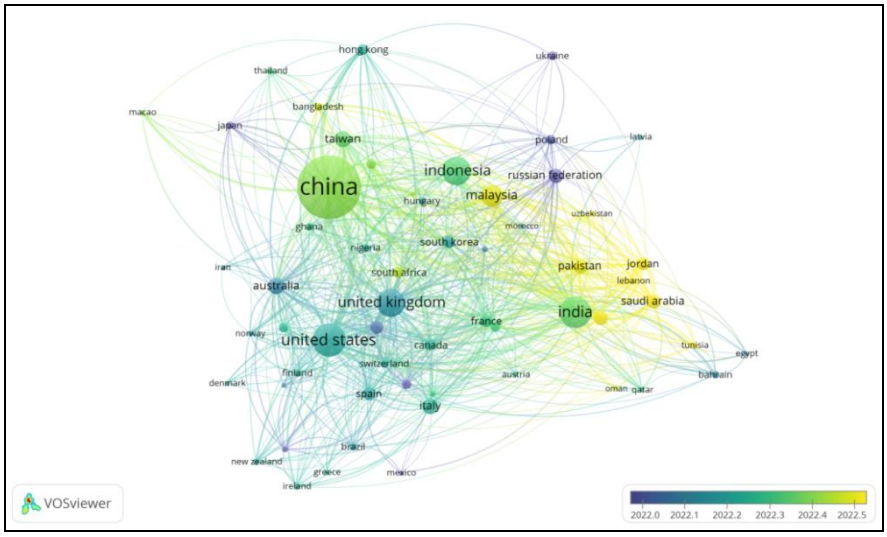

Figure 5: *Co-authorship among Different Countries*

Type of analysis: Co-authorship
Unit of Analysis: Countries
Minimum number of documents of country: 15
Minimum number of citations of country: 10

Figure 5 explains the collaboration between different countries in terms of co-authorship. By default VOSviewer sets the criteria of minimum 5 documents per country. Out of 182, 83 countries meet this condition, but to have the most prominent countries we increase the minimum number of document of country 15 and minimum number of citations of country 10 thus, found 58 countries fulfilling this condition. Result shows that China has largest number of co-authorship rooted across the world. However, the most resent collaboration, although less in number is from Pakistan & Malaysia.

Classification of Digital Finance Research by Subject Categories

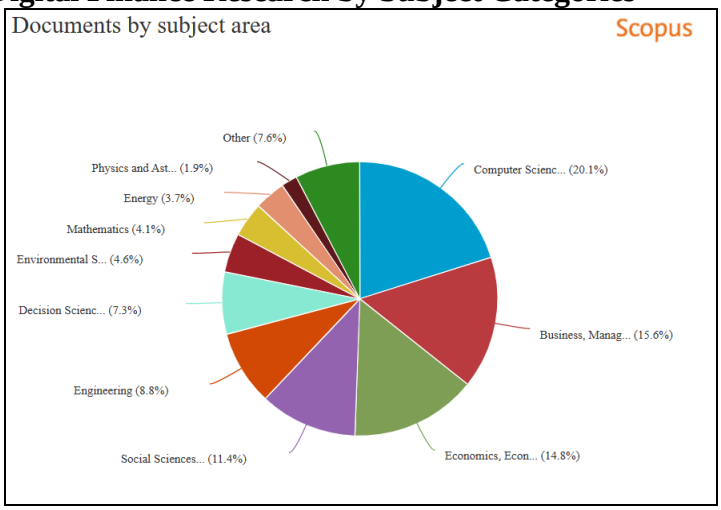

Figure 6: *Distribution of Publication by Subject Area*

Figure 6 offers a comprehensive overview of the primary subject areas for research in Digital Finance or Fintech over the last 20 years. This breakdown underscores that a significant proportion of research in this field falls under the purview of Computer Science, constituting a noteworthy 20.1% of publications. Following closely, Business Management & Economics also exhibit substantial interest in exploring this intersection, encompassing a total of 45.2% publications. Moreover, the prevalence of research in fields such as Social Sciences, Engineering, Mathematics, and Environmental Science highlights the interdisciplinary nature of studies related to Digital Money worldwide. This implies a holistic approach to comprehending the multifaceted impact of Digitalization on various facets of Finance and beyond.

Prominent Journals Steering Discourse in Digital Finance

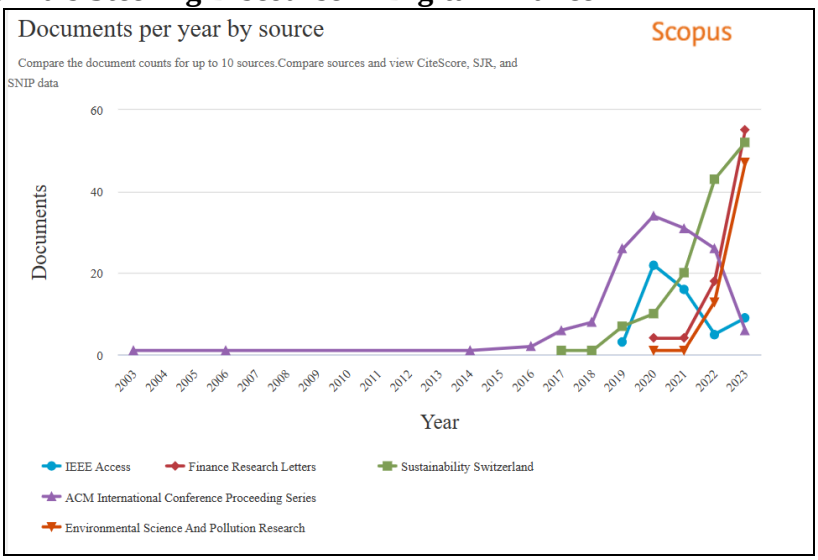

Figure 7: *Top Journals contributing to the Publications related to Fintech*

Figure 7 highlights the most influential journals in the field of Financial Technology and Digital Money Publications globally spanning from 2003 to 2023. Remarkably, "Sustainability Switzerland" has emerged as the preeminent journal, encompassing 118 documents within the Scopus database during this period. In close pursuit, "Finance Research Letters" also distinguishes itself with 88 documents from 2003 to 2023, reaching a peak of approximately 55 documents in 2022. The ACM International Conference Proceeding Series exhibited a substantial surge in publications in 2020, signifying increased scholarly engagement in this domain. Notably, post-2020, the publications from ACM experienced a decline. Overall. this underscores the persistent scholarly dedication to unraveling the significance of the digitalization of financial affairs amidst the backdrop of global upheaval.

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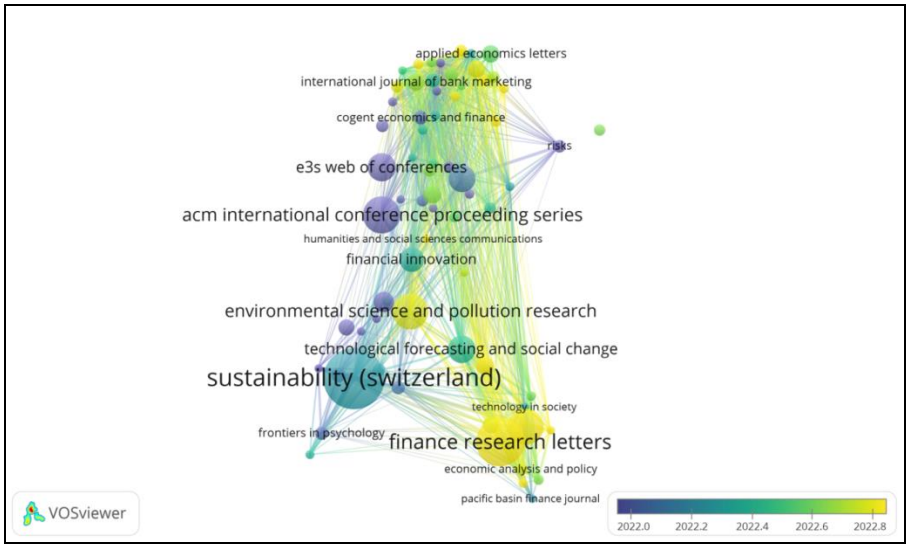

Figure 8: *Bibliographic Coupling of Different Sources*

Type of analysis: Bibliographic Coupling
Unit of Analysis: Sources
Counting Method: Full Counting
Minimum number of documents of source: 10
Minimum number of citations of source: 10

Out of 1462 sources, only 170 meet the criteria, requiring a minimum of 5 documents and no citations for each source. When narrowing the search to sources meeting the more restrictive criteria of a minimum of 10 documents and 10 citations, 69 sources are found to meet this threshold. The analysis of figure 8 aligns with the insights provided in Figure 7. However, concerning collaboration, it is discernible that "Sustainability Switzerland" and "Finance Research Letters" stand out as the most approached journals by authors, who also contribute to numerous other journals.

Affiliation of Authors with Leading Institutions

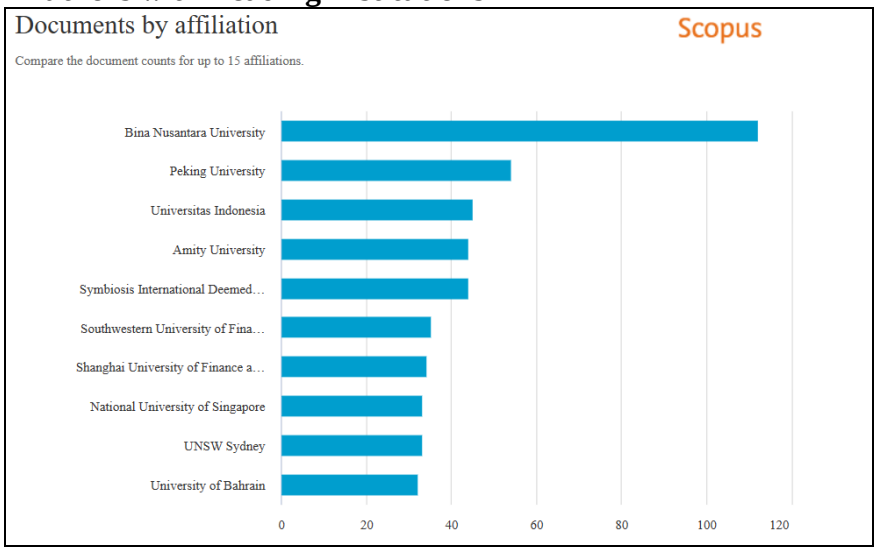

Figure 9: *Top 10 Institutional Affiliations by count of Publication*

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Figure 9 provides an overview of the affiliations of authors making Fintech publications across influential institutions. Particularly noteworthy is the Bina Nusantara University in Indonesia, which distinguishes itself with a substantial contribution of approximately 110 documents, indicating a significant commitment to exploring the adoption of Financial Technology. Additionally, the majority of the remaining institutional affiliations, such as Peking University, Universitas Indonesia, Amity University, Shanghai University of Finance and Economics, National University of Singapore, and the University of Bahrain, predominantly represent Asian countries. This underscores a robust interest and active participation from Asian institutions in the field of Financial Technology. In essence, this distribution highlights the global nature of research in the Financial Technology domain, showcasing contributions from diverse Asian institutions. It also implies a potential opportunity for enhanced collaboration and knowledge exchange among institutions from different regions.

Famous Author by Count of Publications

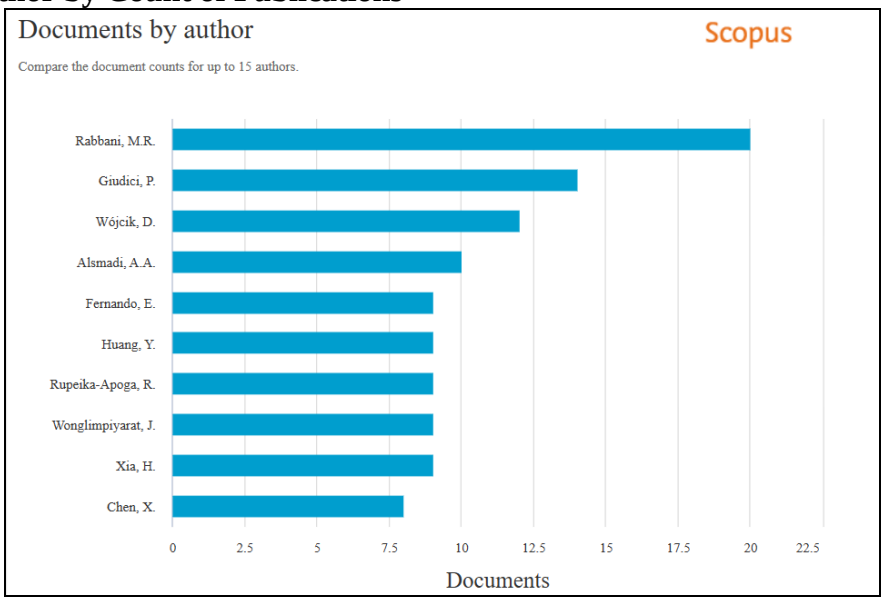

Figure 10: *Famous Names of Authors for Fintech Publications*

Figure 10 underscores the prominence of influential authors in the realm of Financial Technology and Digital Money Publications. Notably, "Rabbani" stands out as the foremost author, contributing a substantial 20 documents within the Scopus database. Following closely, "Giudici" also establishes distinction with 13 documents spanning from 2003 to 2023. Meanwhile, Chen, X holds the tenth position as one of the noteworthy authors, boasting approximately 8 publications in this domain.

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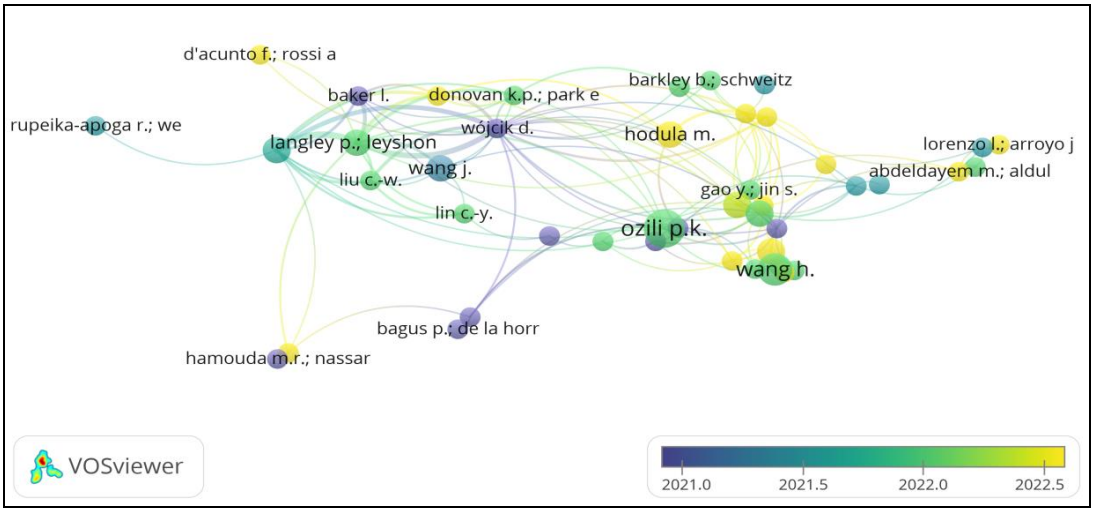

Figure 11: *Bibliographic Coupling of Authors*

Type of analysis: Bibliographic Coupling
Unit of Analysis: Author
Counting Method: Full Counting
Minimum number of documents of author: 2
Minimum number of citations of author: 5

The completion of research on a specific subject often requires collaborative efforts due to the complexity of scientific projects. Co-authorship, a significant aspect of bibliometrics, serves as an indicator of collaborative strength essential for successful scholarly endeavors. Figure 11 focuses on co-authorship analysis, utilizing VOSviewer software to examine collaborative patterns among authors. The analyses reveal a nuanced understanding of the interconnected relationships within the academic community, showcasing the intricate fabric of scholarly collaboration.

V. CONCLUSIONS

In conclusion, the bibliometric analysis furnishes an exhaustive overview of the research landscape, concerning Trends of Digital Finance. The discerned trends, influential nations, journals, institutions, and research domains yield crucial insights for scholars, policymakers, and stakeholders navigating this dynamic and swiftly evolving field. Subsequent research should aim to build upon these foundations to tackle emerging challenges and harness the potential of Fintech for positive transformation across the world.

The network of keyword occurrences served as a valuable reflection of prevailing research trends, delineating study hotspots within the specific domain. Analytical approaches similar to those used for keywords were applied to identify frequently used phrases or words in paper titles and lists of keywords, providing enhanced insights into the construction of this particular field of study. The intellectual core of the content was unveiled through the analysis of keywords. The VOSviewer analysis uncovered a total of 14,594 keywords across articles related to fintech or financial digitalization. Employing various thresholds for keyword occurrences highlighted the most trending keywords, resulting in the identification of 50 keywords categorized into four clusters. The Digitalization of Finance emerged as a

significant node in both Cluster (1) and Cluster (2), underscoring its primary focus in the study.

Examining the chronological progression of research from 2003 to 2023, the study revealed a substantial increase in publications on Digital Finance or Fintech, particularly after 2018, possibly influenced by the global shift toward online services during the COVID-19 pandemic. The trajectory indicates a continuous increase in publications, suggesting a sustained interest in the subject. The distribution of research on the intersection of Financial Digitalization and Financial Technology showcased China as a leader with approximately 1400 publications, followed by the United States and Indonesia. Notably, there was a research gap in Middle Europe, indicating a need for increased focus in that region.

Collaboration analysis illustrated China's extensive co-authorship relationships globally, while the most recent collaborations emerged from Pakistan and Malaysia. The thematic analysis of affiliations emphasized the significant contribution of Bina Nusantara University in Indonesia and the active participation of various Asian institutions in the field of Financial Technology. The study identified influential authors, with "Rabbani" standing out as the foremost contributor. Co-authorship analysis using VOSviewer software provided a nuanced understanding of the interconnected relationships within the academic community, highlighting the intricate fabric of scholarly collaboration.

Overall, the comprehensive bibliometric analysis offered valuable insights into the global research landscape of Digital Finance or Fintech, emphasizing the multidisciplinary nature of studies and showcasing the dynamic collaborations among researchers and institutions. The study paves the way for informed insights and future research directions in this evolving field

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