



Is there any association between FinTech and sustainability? Evidence from bibliometric review and content analysis

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Abstract

This study highlights the latest trends in the literature on the relationship between FinTech and sustainability by applying a bibliometric review of documents published in the Scopus database. Bibliometric analysis is a quantitative method that allows researchers to highlight core foundations and recent trends in a specific research field. This analysis was based on trend, evolution, bibliometrics, mapping, and qualitative content analyses. Based on a bibliometric review of 59 papers retrieved from the Scopus database, this study explores the most frequent keywords; the most influential authors, organizations, and countries; the most cited papers; the most co-cited reference papers; and sources. Evolution analysis was conducted using CiteSpace; bibliometric and mapping analyses were performed using VOSviewer; and content analysis was performed using WordStat. The results identified three major clusters: sustainability performance, blockchain technology, and digital transformation. Additionally, the results reveal that the analysis of the association between FinTech and sustainability has experienced increasingly important growth in 2021, reflecting the importance of financial technologies and innovations in business. The findings of this study have implications for Fintech and sustainability research and highlight the importance of Fintech in the development and execution of sustainability strategies and practices, as well as the most relevant research methods. This study provides an overview of how the literature on the association between FinTech and sustainability has developed, as well as a summary of the most influential authors along with countries, organizations, and journal sources. This study offers an opportunity for future research in this field.

Keywords Bibliometric analysis · FinTech · Sustainability · VOSviewer · CiteSpace · Content analysis

JEL Classification G34 · G39 · O16

Introduction

Bibliometric analysis has gained widespread interest among researchers over the last decade (Donthu et al. 2021; Khan et al. 2021; Paul et al. 2021; Kraus et al. 2022; Lim et al. 2022; Mukherjee et al. 2022) owing to the increasing availability of software programs, multidisciplinary methodologies, and large databases. Additionally, researchers can use this method to identify trends in a research field and analyze the different aspects of a research topic. Moreover, it can provide an overview of the topics and publications that have been published in a specific research field, as well as the

most influential authors, organizations, countries, and references. This study focuses on the association between Fintech and sustainability, which is of great interest.

This study focuses on FinTech and sustainability, as their importance has increased due to digital transformation and the emergence of Sustainable Development Goals (SDGs). FinTech and sustainability have become areas of great interest not only for researchers to examine the implications of digitalization but also for policymakers to ensure high compliance with SDGs. In the last decade, the increasing number of Fintech companies and the creation of many international legal bodies promoting sustainability have prompted many countries to raise questions about the role of Fintech in ensuring sustainable economic development.

Financial technologies have evolved substantially during the last decade owing to advancements in digitalization. The emergence of new technologies such as

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blockchains has attracted the attention of various financial experts and technologists, leading to the development of new strategies and methods (Zhao et al. 2019). The financial sector is currently the main user of these technologies because of their application to banks (Dozier and Montgomery 2020). These technologies have facilitated the development of alternative payment methods (Visconti-Caparrós and Campos-Blázquez 2022), the prevention of money laundering and terrorist financing (Akartuna et al. 2022), the promotion of cryptocurrencies (Nasir et al. 2021), and trading in capital markets (Kauffman et al. 2015). These technologies are not limited to the financial industry; they are also applied in small and medium enterprises (Menne et al. 2022), supply chain companies (Tseng et al. 2021), and industrial corporations (Jiao et al. 2021; Kimani et al. 2020).

Most studies have examined FinTech as an outcome of the development and growth of blockchain and artificial intelligence technologies (Fernandez-Vazquez et al. 2019; Cumming et al. 2022; Goodell et al. 2021; Kumar et al. 2022) as well as digital transformation (Dorfleitner et al. 2022). Several recent studies have explored the role of FinTech in improving financial innovation (Menne et al. 2022; Najib et al. 2021; Shin and Choi 2019; Zhao et al. 2019) and ensuring sustainable development (Deng et al. 2019). With regards to the sustainability, several studies have examined the contribution of FinTech in banking sector (Ji and Tia 2022; Kangwa et al. 2021; Saif et al. 2022), while others introduced the concept of green FinTech sustainability (Puschmann et al. 2020).

By applying a bibliometric analysis, this study identified the most frequent topics related to the association between FinTech and sustainability and published in the Scopus database, analyzed the evolution of this research field over the years, determined various gaps in the literature, and proposed paths for future research.

This study had five research questions: The first question is as follows: What's the evolution in the research about the association between FinTech and sustainability? The second question: What are the most frequent keywords in published documents? The third question is: What authors, organizations, and countries have contributed the most to this research field? The fourth question is: What are the most cited papers on the association between FinTech and sustainability? The fifth question was, What are the most cited reference papers? The fifth question is: What are the most cited sources? Bibliometric analysis was conducted using VOSviewer, whereas evolution in this research field and content analysis were applied using CiteSpace and WordStat, respectively.

This study aims to achieve the following objectives: (1) shed light on the major contributions in the analysis of the association between FinTech and sustainability (RO1); (2)

identify the most influential authors, organizations, countries, and papers (RO 2); and (3) provide directions for future research on this topic (RO3).

To the best of our knowledge, there has been no single bibliometric analysis of previous studies on the association between FinTech and sustainability. This is the first study to shed light on this research field. This study contributes to the literature by evaluating the most relevant topics in FinTech. These results indicate three major clusters: sustainability performance, blockchain technology, and digital transformation. In addition, the results reveal an evolution in research on the role of FinTech in sustainability over the years, and this topic has increasingly experienced significant growth in the number of papers and citations, reflecting the significant importance of FinTech in the field of sustainability. In addition, this study identifies the authors, countries, organizations, and references that have been the most influential in terms of publishing documents in the Scopus database.

The remainder of this paper is organized as follows. In "Methodology and data" section presents the methodology and data. In "Publication trend, bibliometric, and content analyses" section interprets the bibliometric results, "Discussion" section presents the conclusions, and "Conclusion" section concludes the paper.

Methodology and data

Methodology

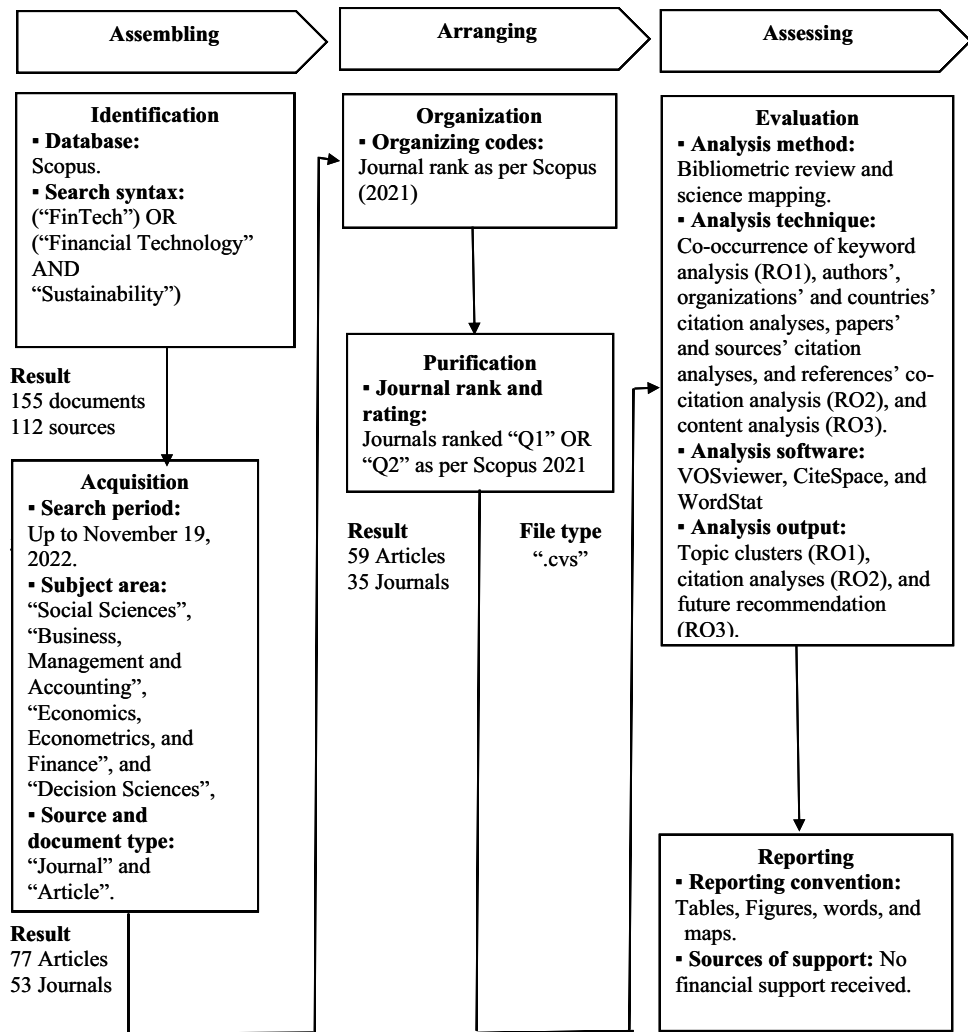
This study applied bibliometric analysis by considering both quantitative and qualitative approaches (Khan et al. 2021). Thus, the following analyses were conducted: (1) trend and evolution analyses; (2) keyword co-occurrence cartography analysis; (3) bibliometric authors', organizations, and countries' citation analyses; (4) bibliometric papers' and sources' citation analyses; (5) bibliometric references' co-citation analysis; and (6) content analysis. Bibliometric analysis was conducted using VOSviewer, whereas the evolution of research on the association between FinTech and sustainability was applied using CiteSpace and content analysis using WordStat.

Data

Following Paul et al. (2021), we used the new review procedure of the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) protocol. The search methodology and the different stages of data extraction are presented in Fig. 1. As per the SPAR-4-SLR protocol, the



Fig. 1 Review procedure using SPAR-4-SLR protocol



three different stages of assembling, arranging, and assessing were conducted.

Assembling

The assembling stage includes two sub-stages: identification and acquisition (Paul et al. 2021). The objective of the identification sub-stage was to find articles on the association between FinTech and sustainability. The Scopus database was selected as search engine as it includes highly ranked journals compared to other databases (Kumar et al. 2022). The search syntax includes the keywords “FinTech” or “Financial Technology” and “Sustainability.” The search syntax was performed in Scopus on November 19, 2022, and yielded 155 documents and 112 sources. In the acquisition substage, additional refinement steps were applied, such as the search period, subject area, source, and document type. The search period was November 19, 2022. The subject areas include “social sciences” “business, management, and accounting,” “economics, econometrics, and finance,”

and “decision sciences.” The sources and document types were journals and articles, respectively. The search yielded 77 articles and 53 journals.

Arranging

The arranging stage of the review includes two substages: organization and purification (Paul et al. 2021). In the organization sub-stage, this study relies on Scopus journal ranking. Following the purification sub-stage, articles were filtered according to the Scopus quartiles Q1 and Q2 to include only highly ranked journals. The search yielded 59 articles and 35 journals. The data were exported to CSV Excel and uploaded to VOSviewer to conduct bibliometric analyses.

Assessing

The assessing stage consists of two sub-stages: evaluation and reporting. In the evaluation sub-stage, 59 articles were reviewed using bibliometric analyses and science mapping



to achieve the research objectives (ROs 1–3). Bibliometric analyses were conducted using VOSviewer to identify the major clusters of high-quality research on the association between FinTech and sustainability and achieving RO1. In particular, the “keyword co-occurrence cartography” tool in VOSviewer was used to identify the main topics related to the research field. In addition, other bibliometric and science mapping analyses were performed, such as authors’, organizations, and countries’ citation analyses, papers’ and sources’ citation analyses, and references’ co-citation analysis, to achieve RO2. Moreover, content analysis was performed to unpack the association between FinTech and sustainability, determine recommendations for future research, and achieve RO3.

In the reporting sub-stage, this study is similar to previous systematic literature reviews (Donthu et al. 2021; Goodell et al. 2021; Khan et al. 2021; Kumar et al. 2022; Mukherjee et al. 2022) and presents results in form of figures, tables, and word. This study did not receive any financial support.

Publication trend, bibliometric, and content analyses

Publication trend

Figure 2 shows the number of papers published on the association between FinTech and sustainability. The first paper on this association was published in 2015, and the development of this field was relatively slow and unstable over the following two years. The number of articles published on the association between FinTech and sustainability began to grow in 2019 and significantly increased in 2022, with an average of 95.20% between 2019 and 2022. The increasing number of articles suggests that academic researchers are becoming increasingly interested in this association. In this trend analysis, papers published in 2022 were considered till November 19th. Almost 66.10% of the papers (39

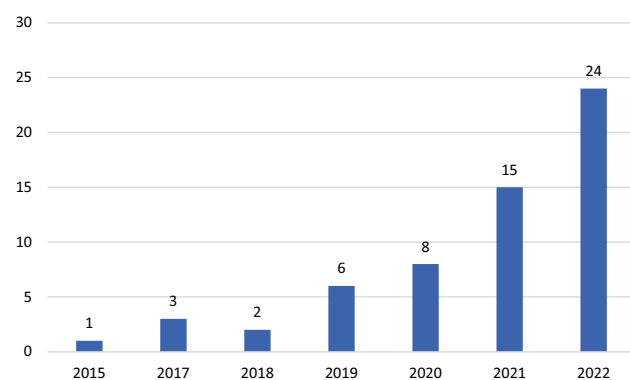


Fig. 2 Publication trend of papers on the association between FinTech and sustainability

59) were published between 2021 and 2022. The increasing number of publications in this field is also attributed to the growing recognition of the importance of the association between FinTech and sustainability concepts at both micro- and macro levels.

Bibliometric analyses

This section summarizes the 59 articles included in this study. These articles were published in Scopus Q1 and Q2 journals. Several bibliometric analyses were conducted to identify (1) trend and evolution analyses in FinTech and sustainability research; (2) co-occurrence of all keywords in cartography analysis; (3) bibliometric authors’, organizations, and countries’ citation analyses; (4) bibliometric papers’ and sources’ citation analyses; and (5) bibliometric references’ co-citation analysis.

Most frequent research topics

Co-occurrence analysis of all keywords was applied to conceptualize the development and growth of the FinTech–sustainability nexus analysis in papers published in Scopus journals. To ensure a meaningful analysis, following Khan et al. (2021), a minimum threshold of two for the co-occurrence of a particular keyword was required and filtered. This yielded 29 of 277 words. The results are reported in Fig. 3 and show three major clusters: sustainability performance, blockchain technology, and digital transformation. The frequent co-occurrence of these keywords among studies reflects the need for research on the nexus between FinTech and sustainability as a response to the emergence of financial technologies and sustainable development goals (SDGs). In addition, both FinTech and sustainability are of great importance for researchers to help companies implement the latest technologies and achieve SDGs to ensure their sustainable development and growth (Soni et al. 2022).

As Fig. 3 and Table 1 show, there are four major clusters: (1) sustainability performance (red), (2) blockchain technology (green), and (3) digital transformation (blue).

In the cluster of sustainability performance, studies have focused on the role of FinTech in achieving sustainable development goals (Deng et al. 2019), the assessment and mitigation of FinTech risks to maintain sustainable development (So 2021), and the development and sustainability of FinTech companies and blockchain technology (Merello et al. 2022; Bittini et al. 2022; Moro-Visconti et al. 2020; Najaf et al. 2022; Schinckus 2020). Other studies focus on green FinTech sustainability (Puschmann et al. 2020).

In the blockchain technology cluster, studies have examined the development and growth of blockchain and artificial intelligence technologies (Fernandez-Vazquez et al. 2019) and the role of FinTech in improving economic,



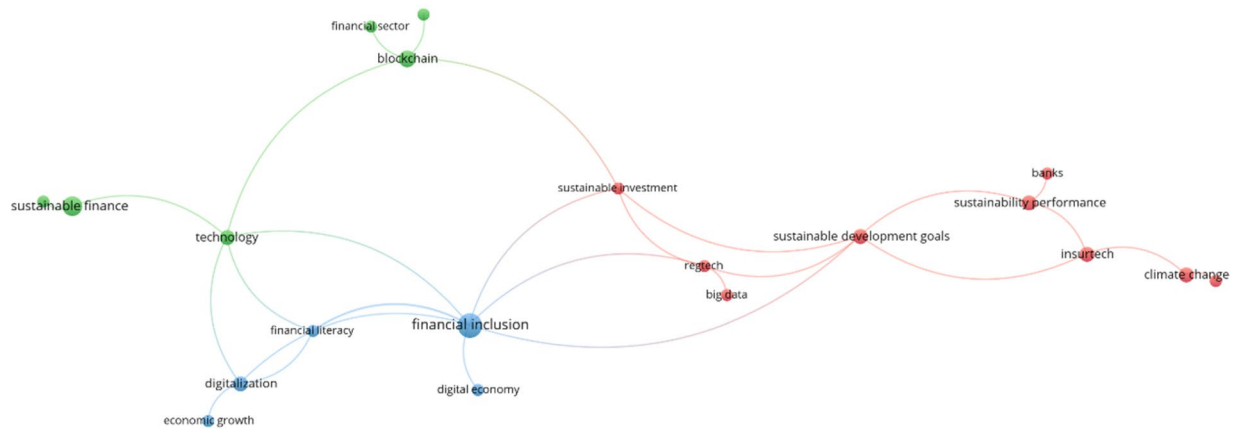


Fig. 3 Keywords analysis

Table 1 Keywords by cluster

Number	Cluster	Keywords
1	Sustainability performance	Bank, big data, climate change, finance, insurtech, regtech, sustainability development goals, sustainable investment
2	Blockchain	Financial regulation, financial sector, innovation, sustainable finance, technology
3	Digital transformation	Digital economy, digitalization, economic growth, financial inclusion, financial literacy

entrepreneurial, and financial innovations (Menne et al. 2022; Al-Okaily et al. 2021; Najib et al. 2021; Shin and Choi 2019; Zhao et al. 2019).

In the digital transformation cluster, studies have explored the role of digital transformation and information technology in economic and financial growth (Dorfleitner et al. 2022) and the implications of FinTech for financial inclusion (Arner et al. 2020; Lutfi et al. 2021).

In addition to VOSviewer, CVS file was converted into Web of Sciences format and uploaded to CiteSpace. CiteSpace was used to analyze the most frequently used keywords in the different stages and development patterns in the analysis of the association between FinTech and sustainability. The most cited keywords were calculated and arranged in CiteSpace by time and frequency to form the time view shown in Fig. 4. The figure shows the most frequently used keywords from to 2015–2023. The first keyword was “technological development” which was included in the study of Rolffs et al. (2015). This latter study focused on the importance of financial technology to achieve the objective of sustainability in energy, which would benefit

the whole society in Kenya. The four keywords of “sustainable development,” “financial system,” “banking” and “decision making” were frequently included in papers between 2016 and 2019, suggesting that the emergence of FinTech was closely related to the financial and banking systems. In addition, FinTech improves the decision-making process and achievement of sustainable development. For instance, Deng et al. (2019) (confirmed the significant association between FinTech and the achievement of sustainable development goals using peer-to-peer platform data in China. In the following years, “financial inclusion” was the most popular keyword in the articles published between 2020 and 2022. Studies have focused on the importance of financial inclusion in economic and sustainable growth (Arner et al. 2020; Lutfi et al. 2021; Kangwa et al. 2021; Pandey et al. 2022).

Authorship analysis

Table 2 presents most cited authors, along with their respective organizations and countries. For a meaningful analysis, the threshold was a minimum of two papers per



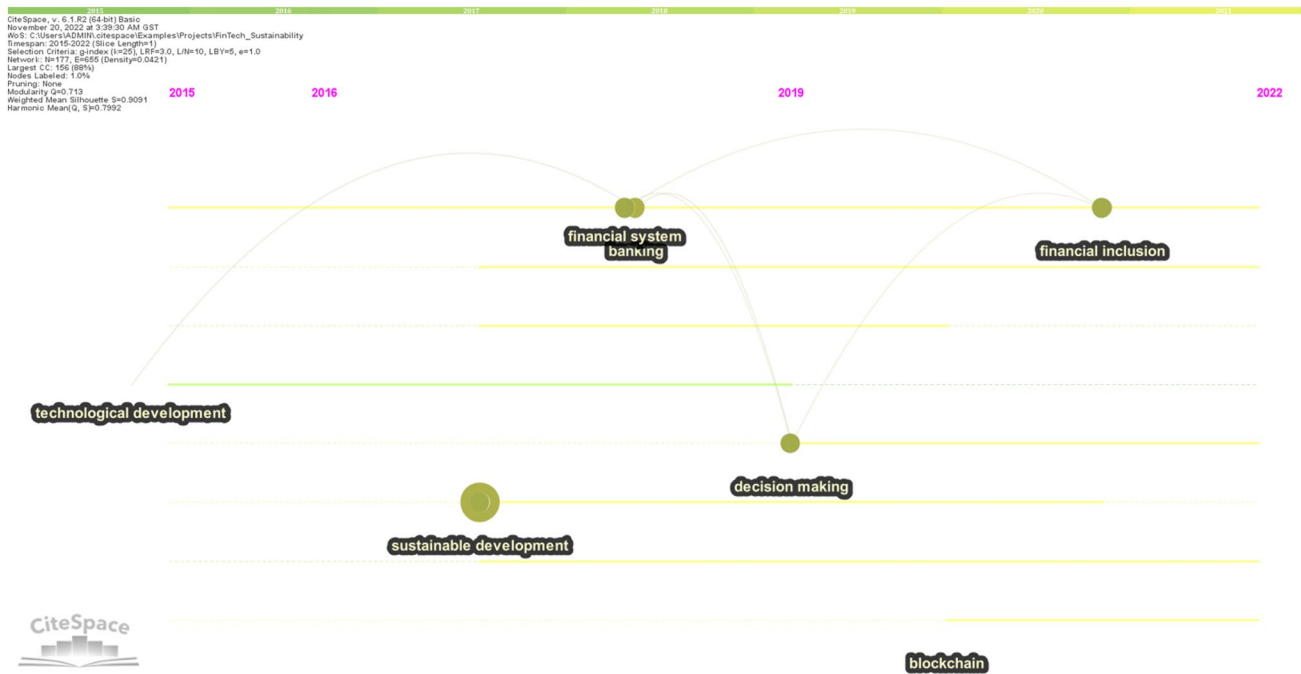


Fig. 4 Evolution over the years of research about the association between FinTech and sustainability

author. This yielded 6 of 179 authors. The highest number of 3 papers was published by Kauffman, followed by Zetzsche, Al-Okunk, Moro-Visconti, Pascual, and Rambaud, who published two papers. In addition, Table 2 shows that Denmark and Singapore take the first place with the highest number of papers and citations. Moro-Visconti, Pascual, and Rambaud were co-authors of two FinTech sustainability papers. Saudi Arabia, Italy, and Spain are increasingly contributing to research publications in the field of association between FinTech and sustainability.

In addition to citation performance analysis, this study applies co-authorship science mapping to identify the major author groups that contributed to the publication of research on FinTech and sustainability (Cumming et al. 2022; Goodell et al. 2021; Kumar et al. 2022). Because the research topic is new, the network of co-authorship is constructed for all authors who contributed by at least one publication in the field. This analysis resulted in two main clusters, as shown in Fig. 5. Both clusters are led by Al-Okaily M. who has the highest number of papers, citations and total link strength. Geographically, the concentrations of authors in both groups are mainly in Jordan. These authors have primarily worked on institutional research across Jordanian universities. The publications of both groups focused on FinTech in the Jordanian context. The publication of the first group focuses on digital financial inclusion (Al-Okaily et al. 2021), whereas the

publication of the second group focuses on sustainable FinTech innovation (Lutfi et al. 2021) (Fig. 5).

Organizations analysis

Table 3 presents the top 10 cited organizations. This corresponds to a threshold of one paper with a minimum of 67 citations which yielded 10 out of 166 organizations. The maximum number of citations is 90. As per the table, European organizations are taking the lead in this research field, as five of the top 10 organizations are located in Europe, particularly in France, the UK, and Turkey. These five universities had 48.33% of the total citations, followed by Asian organizations located in Qatar, South Korea, and Oman, which accounted for 31% of the total citations. Tunisian, French, and US organizations are emerging in this relatively new research topic.

In addition, co-authorship science mapping was conducted to determine the major organizational groups that contributed to research on FinTech and sustainability. Because the topic is relatively new, the network includes all organizations. The analysis revealed two main clusters, as shown in Fig. 6. Both clusters are led by the School of Business at Jadara University in Jordan, which has the highest number of papers, citations, and total link strength. Both groups are geographically concentrated across Jordanian universities. The publications of both groups are related to FinTech inclusion and innovation in Jordan.



Table 2 Most cited authors

Author	Papers	References	Main topic	Papers citation	Organization	Country	Google citations
1 Kauffman	3	Kauffman et al. (2017), Li et al. (2020), Wessel et al. (2021)	Digital transformation	86	Business School, Frederiksberg, School of Information Systems, Singapore Management University	Denmark Singapore	21,418
2 Zetzsche	2	Arner et al. (2020), Zetzsche and Anker-Sørensen (2022)	Sustainability performance	68	University of Luxembourg	Luxembourg	2305
3 Al-Okaily	2	Al-Okaily et al. (2021), Lutfi et al. (2021)	Sustainability performance	25	Department of Accounting, College of Business, King	Saudi Arabia	726
4 Moro-Visconti	2	Bittini et al. (2022), Moro-Visconti et al. (2020)	Sustainability performance	19	Department of Economics and Business Management Sciences, Università Cattolica del Sacro Cuore, Milan	Italy	1169
5 Pascual	2	Bittini et al. (2022), Moro-Visconti et al. (2020)	Sustainability performance	19	Departamento de Economía de la Empresa, Universidad Rey Juan Carlos, Vicálvaro	Spain	1032
6 Rambaud	2	Bittini et al. (2022), Moro-Visconti et al. (2020)	Sustainability performance	19	Departamento de Economía y Empresa, Universidad de Almería, Almería	Spain	960

Countries Analysis

The top ten cited countries are listed in Table 4. This corresponds to a minimum of four papers and thirty-nine citations by country. This yielded 10 of 44 countries. Table 4 shows the distribution of countries publishing articles on the relationship between FinTech and sustainability. The UK contributed the most, with the highest number of citations, followed by China, which contributed the highest number of papers. Taken together, these two countries account for almost 28.57% of the total publications and 33.05% of the total citations. The concentration of research in this field suggests that it has mainly been conducted in a few European and Asian countries.

In addition, an analysis of co-authorship countries was conducted to identify the major country groups that contributed to research on FinTech and sustainability. This analysis provides researchers interested in this topic with information on potential international collaboration. The network of co-authorship countries includes those that have at least two publications, as this research field is still in its early stages. This yielded 21 of the 44 countries. The analysis revealed three main clusters, as shown in Fig. 7. The first cluster consists of ten countries and is led by China, which has the highest number of papers, citations, and total link strength. In addition, China has the most international collaboration with Asian countries, such as South Korea, Singapore, Taiwan, and the Philippines. The main topic of this cluster was sustainability performance. The second cluster consists of six countries, led by the UK, which has collaborative research on the association between FinTech and sustainability. The UK has collaborated with Australia, Hong Kong, and Germany. The third cluster consisted of five countries, led by Malaysia. This cluster reveals that most of Malaysia's research collaborations are with Middle Eastern countries such as Jordan, Saudi Arabia, and United Arab Emirates.

Most cited papers

The top 10 cited papers are listed in Table 5. This corresponds to a threshold of a minimum 23 citations per paper. This yielded 10 of 59 papers. As shown in Table 5, the top two cited papers are entitled “Dynamic risk spillovers between gold, oil prices, and conventional, sustainability, and Islamic equity aggregates and sectors with portfolio implications” and “Beyond technology and finance: pay-as-you-go sustainable energy access and theories of social change”. Both studies explore the role of FinTech in supporting sustainable development. The first focuses on the financial market, while the second focuses on the energy sector. Together, these two papers accounted for 34.77% of the total citations. These two papers are followed by the paper entitled “Sustainability, FinTech and Financial Inclusion” in



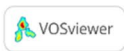
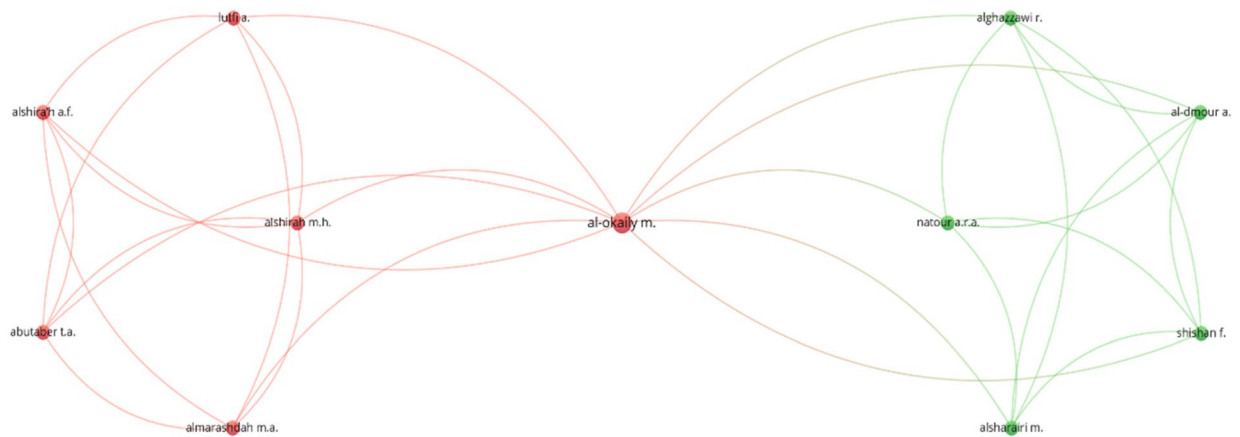


Fig. 5 Co-authorship network

Table 3 Most cited organizations

Rank	Organization	Documents	Citations
1	College of Business and Economics, Qatar University, Qatar	1	90
2	Department of Business Administration, Pusan National University, Busan, South Korea	1	90
3	Department of Economics and Finance, College of Economics and Political Science, Sultan Qaboos University, Muscat, Oman	1	90
4	Department of Finance and Accounting, University of Tunis El Manar, Tunis, Tunisia	1	90
5	Energy and Sustainable Development, Montpellier Business School, Montpellier, France	1	90
6	Faculty of Business Administration, Bilkent University, Ankara, Turkey	1	90
7	Lebow College of Business, Drexel University, Philadelphia, USA	1	90
8	School of Global Studies, University of Sussex, UK	1	87
9	School of Business Management and Economics, University of Sussex, UK	1	87
10	Centre for Finance, Technology and Entrepreneurship, London, UK	1	67

which, Arner et al. (2020) considered that the development of FinTech technologies is the key to financial inclusion and the implementation of the sustainable development goals (SDGs).

Most co-cited reference papers

This section presents the top 20 co-cited references in papers on FinTech and sustainability, published in Scopus journals. This corresponds to a threshold of a minimum number of two citations, which yielded 20 references out of 4322. Table 6 displays all the top co-cited reference papers and indicates that the maximum number of citations is two

because this research topic is relatively new, and the first publication in this field occurred in 2015. Most of the references are article papers, whereas there is only one book. Seven of the co-cited references are related to sustainability performance, while the remaining are divided into financial innovations, financial inclusion, and research methods.

In addition, a co-cited reference network analysis was conducted to identify the clusters in the references. The network included references with the highest number of citations of 2. The results are shown in Fig. 8, and reveal two main references' clusters. The first cluster consists of 11 references that are purely related to FinTech, including the topics of sustainability development, financial innovation, and



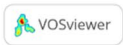


Fig. 6 Co-authorship organizations network

Table 4 Most cited countries

Rank	Country	Documents	Citations
1	UK	6	212
2	China	10	173
3	South Korea	5	151
4	USA	4	151
5	Turkey	4	123
6	Singapore	5	94
7	Italy	6	84
8	Germany	4	67
9	Spain	7	62
10	Malaysia	5	39

financial inclusion. The second cluster includes three references related to research methods and, more particularly, to structural models. This analysis helps researchers examine further the association between FinTech and sustainability, and identify the model to be used in their studies.

Most cited references sources

This section presents a citation analysis of most reference sources. The threshold is a minimum number of papers by source is two and the minimum number of citations of a source is one, which yields four out of 35 sources. Table 7 shows these sources along with their respective

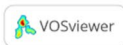
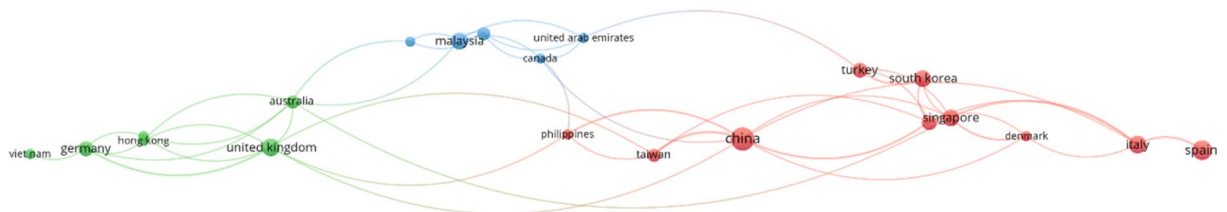


Fig. 7 Co-authorship countries network



Table 5 Most cited documents

Rank	Document	Citations	Title
1	Mensi et al. (2017)	90	Dynamic risk spillovers between gold, oil prices and conventional, sustainability and Islamic equity aggregates and sectors with portfolio implications
2	Rolffs et al. (2015)	87	Beyond technology and finance: pay-as-you-go sustainable energy access and theories of social change
3	Arner et al. (2020)	67	Sustainability, FinTech and Financial Inclusion
4	Zhao et al. (2019)	55	Improving financial service innovation strategies for enhancing China's banking industry competitive advantage during the FinTech revolution: A hybrid MCDM model
5	Li et al. (2020)	49	How should we understand the digital economy in Asia? Critical assessment and research agenda
6	Deng et al. (2019)	33	FinTech and sustainable development: Evidence from China based on P2P data
7	Kauffman et al. (2017)	33	Combining machine-based and econometrics methods for policy analytics insights
8	Schinckus (2020)	31	The good, the bad and the ugly: An overview of the sustainability of blockchain technology
9	McKillop et al. (2020)	28	Cooperative financial institutions: A review of the literature
10	Saraji et al. (2021)	23	Fermatean Fuzzy CRITIC-COPRAS method for evaluating the challenges to industry 4.0 adoption for sustainable digital transformation

Table 6 Most co-cited reference papers

Rank	Co-cited references	Citations
1	Deng, X., Z. Huang, and X. Cheng. 2019. FinTech and sustainable development: evidence from china based on p2p data. <i>Sustainability</i> 11: 6434	2
2	Shin, Y.J., and Y. Choi. 2019. Feasibility of the FinTech industry as an innovation platform for sustainable economic growth in Korea. <i>Sustainability</i> 11: 5351	2
3	Mackenzie, A. 2015. The FinTech revolution. <i>London Business School Review</i> 26: 50–53	2
4	Ryu, H.-S., and K.S. Ko. (2020). Sustainable development of FinTech: focused on uncertainty and perceived quality issues. <i>Sustainability</i> 12: 7669	2
5	Al Hammadi, T., and H. Nobanee. 2019. FinTech and sustainability: a mini-review. https://www.researchgate.net/publication/338285271	2
6	Hommel, K., and P.M., Bican 2020. Digital entrepreneurship in finance: FinTechs and funding decision criteria. <i>Sustainability</i> 12: 8035	2
7	Moro-Visconti, R., S. Cruz Rambaud, and J. Lopez Pascual. (2020). Sustainability in FinTechs: an explanation through business model scalability and market valuation. <i>Sustainability</i> 12: 10316	2
8	Puschmann, T. 2017. FinTech. <i>Business and Information Systems Engineering</i> 59: 69–76	2
9	Qasim, H., and E. Abu-Shanab. 2016. Drivers of mobile payment acceptance: the impact of network externalities. <i>Information Systems Frontiers</i> 18: 1021–1034	2
10	Thaler, R.H. 1999. Mental accounting matters. <i>Journal of Behavioral Decision Making</i> 12: 183–206	2
11	Venkatesh, V., M.G. Morris, G.B. Davis, and F.D. Davis. 2003. User acceptance of information technology: toward a unified view. <i>MIS Quarterly</i> 27: 425–478	2
12	Sekaran, U. 2003. <i>Research methods for business: a skill building approach</i> , 4th ed	2
13	Chen, M.A., Q. Wu, and B. Yang. 2019. How valuable is FinTech innovation? <i>The Review of Financial Studies</i> 32: 2062–2106	2
14	Henseler, J., C.M. Ringle, and M. Sarstedt. 2015. A New criterion for assessing discriminant validity in variance-based structural equation modeling. <i>Journal of the Academy of Marketing Science</i> 43: 115–135	2
15	Senyo, P., and E.L., Osabutey. (2020). Unearthing antecedents to financial inclusion through FinTech innovations. <i>Technovation</i> 98: 102155	2
16	Anshari, M., M.N. Almunawar, M. Masri, and M. Hamdan. 2019. Digital marketplace and FinTech to support agriculture sustainability. <i>Energy Procedia</i> 156: 234–238	2
17	Fornell, C., and D.F., Larcker. (1981). Evaluating structural equation models with unobservable variables and measurement error. <i>Journal of Marketing Research</i> 18: 39–50	2
18	Margolis, J.D., and J.P., Walsh. 2003. Misery loves companies: rethinking social initiatives by business. <i>Administrative Science Quarterly</i> 48 (2): 268–305	2
19	McWilliams, A., and D. Siegel. 2001. Corporate social responsibility: a theory of the firm perspective. <i>Academy of Management Review</i> 26 (1): 117–127	2
20	Guo, Y., and C. Liang. 2016. Blockchain application and outlook in the banking industry. <i>Financial Innovation</i> 2 (1): 24	2



quartiles and SNIP factors. As shown in the table, all journals were ranked in Scopus quartile 1 and had SNIP factors higher than 1.2. The most cited journal was Sustainability, which published the highest number of papers (21) and had the highest number of citations (254). The remaining journals had only two papers each, and Electronic Commerce Research and Applications had the second-highest number of citations of 82. Additionally, Table 7 reveals that Technological Forecasting and Social Change is emerging in the publication of papers on the relationship between FinTech and sustainability.

Content analysis

In addition to bibliometric analysis, a qualitative content analysis was conducted using WordStat. This analysis identified the three most frequent topics in the papers on the relationship between FinTech and sustainability: financial inclusion, sustainability performance, and blockchain. Table 8 presents the results of the study.

The results shown in Table 8 indicate a similarity with the clusters identified by bibliometric analysis with regard to sustainability performance and blockchain.

Financial inclusion represents the highest part of the research on the association between FinTech and

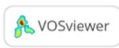
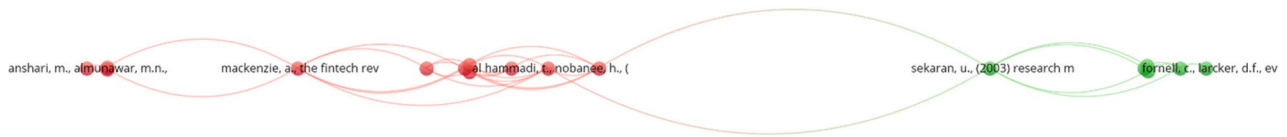


Fig. 8 Co-cited references network

Table 7 Most cited reference sources

Rank	Source	Documents	Citations	Quartile (SNIP)	Publisher
1	Sustainability (Switzerland)	21	254	Q1 (1.31)	Multidisciplinary Digital Publishing Institute (MDPI)
2	Electronic Commerce Research and Applications	2	82	Q1 (1.991)	Elsevier
3	European Business Organization Law Review	2	68	Q1 (1.542)	Springer International Publishing AG
4	Journal of Open Innovation: Technology, Market, and Complexity	2	20	Q1 (1.414)	Multidisciplinary Digital Publishing Institute (MDPI)
5	Technological Forecasting and Social Change	2	5	Q1 (3.097)	Elsevier

Table 8 Content Analysis of papers on the relationship between FinTech and sustainability

No.	Topic	Keywords	Coherence (NPMI)	FREQ	Cases	% Cases
1	Financial inclusion	Infrastructure, financial services, digital, financial products, financial literacy, sustainable growth	0.409	217	56	52.83
2	Sustainability Performance	Performance, adoption, innovation, green, economic, market, FinTech, Business sustainability, financial performance	0.500	249	28	26.42
3	Blockchain technology	Intelligence, efficiency, blockchain, technology, business	0.483	102	22	20.75



sustainability and represents 52.83% of the total topics. It consists of studies that examine the impact of financial inclusion in achieving sustainable development (Arner et al. 2020; Lutfi et al. 2021; Kangwa et al. 2021; Pandey et al. 2022).

Sustainability performance represented 26.42% of all topics. Studies have examined the role of FinTech in improving financial services and bank efficiency (Saif et al. 2022; Kyeong et al. 2022; Ji and Tia 2022; Kangwa et al. 2021; Zhao et al. 2019), the sustainability performance of FinTech companies (Cruz Rambaud and Expósito Gázquez 2022; Moro-Visconti et al. 2020; Bittini et al. 2022; Merello et al. 2022; Najaf et al. 2022; Mutamimah and Robiyanto 2021; Sannino et al. 2020; Schinckus 2020), and the impact of FinTech solutions on promoting sustainable finance (Bayram et al. 2022).

Blockchain technology accounted for 20.75% of the total topics. It includes studies that examine the development and growth of blockchain and artificial intelligence technologies (Ji and Tia 2022; Chen and Volz 2022; Fernandez-Vazquez et al. 2019) as well as studies on the role of information technology and digital transformation in economic and financial growth (Dorfleitner et al. 2022), and in dealing with sustainability issues (Mishra and Kaushik 2021).

Discussion

The results of this review are summarized in this section. One of the main issues faced in this review is the low number of papers related to the association between FinTech and sustainability due to topic novelty. This review examines the evolution of research on the association between FinTech and sustainability between 2015 and 2022. The publication of papers on this topic was slow between 2015 and 2018, while the number of published papers in highly Scopus Q1 and Q2 journals significantly increased by 2022. This review identified three main clusters: sustainability performance, blockchain technology, and digital transformation. The number of citations by authors and papers was relatively low. The most cited reference papers were related to the sustainability performance cluster, and all the most cited reference journals were ranked Scopus Q1. Research on this topic has been concentrated on a few Asian and European organizations. In addition, the results reveal the international collaborations across specific countries that help researchers identify potential collaborations in their future research, as well as the most relevant research methods to be applied.

Recommendations for future research

This section discusses how companies can benefit from FinTech to maintain sustainable development. The integration

of FinTech has been extensively examined in the banking industry, and more attention should be given to SMEs that contribute significantly to economic development and sustainability.

(a) *Mitigation of information asymmetry*

The rapid emergence and evolution of FinTech has led to the development of new ways for small businesses to access finance. One of these ways is peer-to-peer (P2P) lending, a type of crowdfunding that allows individuals and businesses to connect with each other. However, information asymmetry can affect the quality of transactions and the viability of platforms. Lenders and online P2P platforms have attempted to minimize the impact of this issue by implementing various mechanisms (Cummins et al. 2019). It would be interesting to further understand FinTech's role in decreasing information asymmetry, improving corporate efficiency, and enhancing small business sustainability.

(b) *Achievement of sustainable finance*

Despite long-standing differences between the FinTech and sustainable finance pillars, they have common features and offer great potential if combined. Specifically, FinTech can provide solutions that address issues related to sustainable finance frameworks, such as retail financing and environmental, social, and governance (ESG) disclosure (Macchiavello and Siri 2022). However, the association between FinTech and sustainability practices is considered an unexplored research field, and it would be interesting to further analyze it to enhance the achievement of social and environmental goals.

(c) *Strong corporate governance*

Corporate governance plays a major role in reducing conflicts of interest within a corporation. Most previous studies examined the impact of corporate governance on financial performance, while more attention should be given to the role that FinTech could play in strengthening corporate governance, detecting fraud, enhancing profitability, and boosting sustainability.

(d) *Development of technological innovations*

Financial innovations help companies improve their efficiency and economic growth by reducing agency costs and risks (Li et al. 2020). Future research should examine how FinTech promotes technological innovation. This will assist companies in gaining a competitive advantage, increasing their financial performance, and enhancing their sustainability.



(e) *Corporate resilience*

Since 2019, the COVID-19 pandemic has attracted the interest of many researchers, who have explored its impact on corporate performance. In addition, the pandemic has increased FinTech adoption, particularly mobile applications, during government lockdowns (Fu and Mishra 2022). More studies should be conducted on the role of FinTech in reducing the negative impact of this pandemic on corporate sustainability, as well as in improving corporate resilience against any other potential crisis.

Limitations

Although the review provides valuable insights into the association between FinTech and sustainability, it has a few limitations. The search query included general terms of FinTech and sustainability in the titles, abstracts, and keywords, but the number of papers published in Q1 and Q2 Scopus journals was low due to the novelty of the topic. In addition, the review included only papers extracted from the Scopus database and did not include papers published in other databases, such as Web of Sciences.

Conclusion

This study analyzes papers published in Scopus journals on the nexus between FinTech and sustainability to determine the growth of this research field, identify the key concepts and ideas related to this particular research field, and provide recommendations for future studies.

By applying various trends, bibliometrics, evolution, and content analyses, this study identifies the most productive authors, organizations, and countries in the field of FinTech. In addition, this study identified four major research topics related to (1) sustainability performance, (2) blockchain technology, and (3) digital transformation.

This study has theoretical and practical implications. First, it provides an overview of the evolution and trends of studies on the nexus between FinTech and sustainability published in the Scopus database and identifies the most relevant topics. Second, it helps researchers to understand the most recent topics, documents, and relevant references. Third, FinTech researchers can use the findings of this study to identify areas of future research opportunities that they should focus on. For instance, they can analyze various issues related to FinTech to achieve development goals in different industries. Most previous studies have focused only on the banking system, while more attention should be given to other industries that contribute significantly to economic development and sustainability. It is also important for researchers to conduct studies to improve their

understanding of the major role of FinTech in enhancing sustainable economic development.

In addition, it has been observed that there is a gap in the literature regarding the associations between FinTech and sustainability disclosure practices which is considered as an unexplored research field related to the disclosure practices. FinTech can also be related to different critical corporate decisions to improve the corporate financial performance. In addition, more studies should be conducted on the role of FinTech in reducing the impact of the COVID-19 pandemic on companies' efficiency and sustainability. This will be of great interest for future research. This would help to understand the role of FinTech in increasing future economic resilience and improving sustainable economic development.

Future studies should consider other databases (such as Web of Sciences) to examine trends in the FinTech field. This study focuses only on the Scopus database. Despite these limitations, this study provides a useful overview of the current FinTech topics.

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