

REVIEW

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Harnessing digital technologies for triple bottom line sustainability in the banking industry: a bibliometric review

Megha Garg^{1*}  and Parveen Kumar¹

Abstract

The interconnection between the consequences of digital technologies and their impact on triple bottom line sustainability in the banking industry has emerged as a dynamic, multidisciplinary, and eclectic research area of global significance. Nevertheless, applying a systematic literature network analysis in this field has not yet been attempted. Therefore, this paper aims to investigate academic research by integrating different knowledge systems. To conduct this comprehensive analysis, this study employed the contextualized systematic literature review and bibliometric approaches method to make inferences from 154 publications obtained from the Scopus and Web of Science databases for the years 2012–2024 by using the biblioshiny tool. The study's findings exhibited a noticeable upsurge in research trends in the last five years. With 64 publications, 2023 was the most productive year, and 2018 had the most influence with 188 citations. China, Italy, Spain, Egypt, and Malaysia were the most productive countries regarding citation performance. This study highlights the counterintuitive connection between digitalization, financial inclusion, sustainability, fintech, and sustainable development by providing support with recent literature to reflect the current developments in the field. The themes encountered here are crucial for regulators and practitioners who aim to capitalize on the mutually reinforcing nature of the two phenomena in the banking industry.

Keywords Digital technologies, Sustainability, Triple bottom line, Bank 4.0, Sustainable development, Digital transformation, Bibliometric analysis

Introduction

The financial industry is continually exploring new possibilities and innovations due to the potential of digital technology (dig-tech). The massive acceptance of digital banking over traditional banking procedures is one of the most commendable advancements in the finance sector's digital landscape. This trend indicates that even the most established and conservative sector of the economy, the banking sector, embraces potentially profound disruptive technological breakthroughs and internet-based

solutions [102]. Apart from that, banks are encountering increased pressure to consider sustainability [25] in light of the world's expanding economy, widening social disparities, and dwindling natural resources [19]. These demands may originate internally from stakeholders [76, 114], or externally, from customers [5] and regulatory bodies [43]. In response to these mounting challenges, many banks and financial institutions have modified their business models to incorporate environmental, social, and economic considerations. They also need to develop new business strategies that leverage dig-tech to maintain their sustainability and the sustainability of a legitimate financial system [33]. In this dynamic era, the banking industry has the potential to benefit from the vast array of digital technologies, such as artificial intelligence (AI), blockchain technology, augmented reality, chatbots,

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cloud banking, biometrics, and others [98] as they enable swift and adaptable infrastructure, reduced risk, streamlined payment processes, and instantaneous lending [15]. Accordingly, digitalization influences accountability and transparency, opening new avenues for directing, regulating, and shaping sustainability [101]. Besides, banks are anticipating greater benefits from dig-tech, such as:

- Economic, e.g., improved operational efficiencies in terms of automation, data management, and integration, etc.
- Environmental, e.g., an increase in energy efficiency, decrease in paper consumption level and carbon footprint, etc.;
- Social, e.g., increased customer satisfaction, financial access, decreased corruption level, etc.

These advantages can be achieved by the confluence of various technological advancements that curtail the length and breadth of the service value chain. In parallel, the fusion of dig-tech has led to the deployment of a new banking paradigm termed Banking 4.0 [89] which leverages Industry 4.0 propositions in its operations to effectively address emerging needs through contemporary strategies and products, while also providing higher productivity through implementing innovations into action [63].

According to IBM World Business Partner in Taiwan, the organization has been ready to usher into the Bank 4.0 era [69]. Consequently, financial institutions will be configured to offer a cohesive system that enhances mobile

banking by offering capabilities to support the automation of banking procedures. In describing the development of banks over the last few decades, the internet helped Banking 1.0 develop into Banking 2.0. Banking 3.0 has emerged due to the rapid surge in the prominence of smartphones. The transition of Bank 3.0 to Banking 4.0 is facilitated by the development and maturation of new technologies, such as voice recognition, virtual reality platforms, and artificial intelligence [89]. Remarkably, the progression of dig-tech has revolutionized banking operations and paved the way for enduring success and financial stability, eventually leading to economic stability. According to the literature, technological advancement in the era of 4.0 has given a powerful impetus to banking systems to widen their services by integrating online banking services. Typically, this shift is anticipated to streamline management and operations, lower substantial technical errors [18], and develop adequate environmental strategies to address obstacles and attain environmental sustainability [85]. In the same vein, the digital repository of transaction records facilitates the elimination of corruption by enhancing the regulation of illicit activities [122, 123], thereby narrowing income disparities resulting in social sustainability.

Presently, reviews about the relationship between dig-tech effects and/or relationship to sustainability notably centered in banking have become more prevalent in recent years. Table 1 unveils a comparative analysis of fourteen reviews identified in the data extraction process of the systematic literature review. From this, we figure out that our work stands out from other reviews

Table 1 Shows the previous reviews about the impact and/or potential of dig-tech on the sustainability of banking

Paper	Description of the content
Al-Baity [8]	Review focused on specific technology of artificial intelligence applications
Bracarense [20]	Review focused on the development of research agenda for artificial intelligence and sustainability with no specific focus on banking sector and no focus on other dig-tech
Chawla and Goyal [30]	Review presents the emerging research themes under digital transformation concept
Ellili [48]	Review with no specific focus on dig-tech focused on identifying the association between fintech and sustainability
Gálvez-Sánchez [55]	Narrowed to the specificity of financial inclusion
Hassan et al. [65]	General review on blockchain technology and sustainability issues with no specific focus on sustainability dimensions
Lasak and Wyciślak [78]	Narrowed to blockchain and cloud platforms
Mavlutova et al. [87]	Focused on the identification of dig-tech for achieving sustainability goals with no focus on environmental and social dimension
Mbaidin et al. [88]	Review synthesizing the knowledge on the adoption of blockchain technology for sustainability
Osei et al. [102]	No specific focus on the sustainability of digital transformation in the banking sector, focused on the development of the intellectual framework of digital banking transformation
Sang [111]	Review focused on knowledge management in banking
Sharma [113]	Narrowed to big data in finance with no specific focus on sustainability issues
Taneja et al. [118]	Review with no specific focus on sustainability of dig-tech, focused on the development of research agenda for dig-tech
Zaman et al. [131]	Review presents the impact of digitalization on e-commerce service supply chain with no specific focus on dig-tech and sustainability outcomes

that have been found considering that they were more narrowly focused and emphasized particular concepts (like financial inclusion), technologies (like blockchain technology or artificial intelligence), industries (like supply chains), and aspects (like economic only). Currently, no reviews address the triple bottom line standpoint in detail while also taking into account dig-techs such as blockchain technology, big data, artificial intelligence, cloud computing, and robotic process automation together in the banking field. Unfortunately, although undoubtedly one of the fastest-growing phenomena, digital technology's applications in sustainability are still not widely acknowledged [23, 39, 59, 87]. Figure 1 depicts the research gap that overlaps the construct banking, dig-techs, and sustainability.

Based on the available literature, the following five research questions (RQs) were raised which have not yet received a comprehensive scientific response:

RQ1 How has research on dig-tech and sustainability been distributed between 2012 and 2024 in the banking domain in terms of publications and citations?

RQ2 Who are the most influential contributors (authors, journals, countries, and keywords) to the extant literature?

RQ3 Which prominent documents show the intersection between dig-tech and the triple bottom line (economic, environmental, and social) of sustainability concepts in the banking sector?

RQ4 How have the conceptual and intellectual structures evolved to identify clusters and themes in this research area over the years?

RQ5 What are the emerging research themes/trends and future research directions for scholars and practitioners?

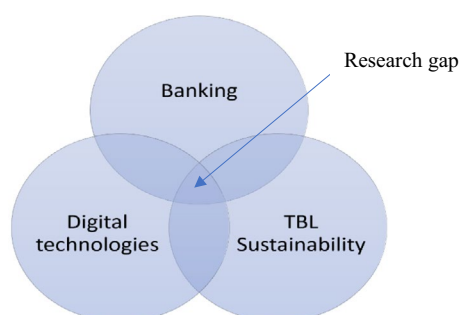


Fig. 1 Research gap at the intersection of banking, dig-tech, and sustainability. Source: Authors

For this, the systematic literature network analysis (SLNA) technique was employed to provide retrospection of the prevailing literature and close emerging gaps that were found in the literature of this domain. This relationship which is still a little hazy lies in an extensive qualitative evaluation predicated on a literature survey. The outcomes of the study allowed for the consolidation of available knowledge in the research field for understanding how digi-tech can contribute to the triple bottom line (TBL) of sustainable development in the banking sector. A meticulous and comprehensive evaluation of the sustainability and digi-tech literature gives the authors an advantage over other scientific studies via:

- Leveraging the dynamic SLNA to rationalize and organize the state-of-the-art knowledge on the subjects under consideration;
- Describing the four aspects of the literature analysis: (1) systematic review, (2) type and application of reviewed study, (3) performance analysis, (4) scientific mapping of literature review;
- Endeavoring to provide solutions addressing research questions from the current published studies on these issues;
- Adding to the existing corpus of research literature concentrating on integrating both concepts.

This paper has been categorized into several distinct sections. Section “**Introduction**” elucidates the context for the research outlining the boundaries, significant developments, and research gap. Section “**Research background**” is subdivided into three subsections: Digi-techs in the banking sector, the triple bottom line of sustainability, and a brief about the previously available research on this subject. Section “**Research methodology**” describes an overview of the technique based on the SLNA framework, search strategy, and data extraction process. The section “**Results**” elaborates on the comprehensive research findings that answer the research questions. The section “**Discussion**” contemplates the findings, states the limitations, and outlines the pivotal implications, and finally section “**Conclusion**” paves the way for final observations, emerging themes, and future research directions.

Research background

Digital technologies

The term “digital technologies” refers to a paradigmatic combination of multiple innovative and revolutionary technologies in the era of Industry 4.0 [80]. In this regard, the authors Mavlutova et al. [87] conducted structured interviews with financial industry experts hailing from the Baltic nations to determine which digi-tech solutions

are most frequently considered by firms to achieve sustainability goals. Accordingly, five dig-techs can be identified:

- Artificial intelligence: characterized as a general mental ability for learning, reasoning, and solving problems [116].
- Mobile wallets: securely and wirelessly conduct payments while storing personal information, including credit card numbers [115].
- Cloud computing: architectural models that provide ubiquitous, effortless, and instantaneous network access to shared resources like servers or networks [90].
- Blockchain technology: distributed ledger system that facilitates data integrity, decentralization, and transparency [74].
- Process automation: software technology designed to imitate human interactions across different apps to carry out rules-based procedures [125].

The triple bottom line of sustainability

The notion of sustainability has gained worldwide recognition over the past two decades from scholars as well as practitioners [108]. Comprising three interconnected pillars, sustainability is concerned with the equitable integration of social, economic, and environmental performance of human life in a balanced and beneficial manner to both present and future generations [58]. Considering the vague and perplexing nature of sustainability, the term "triple bottom line" sustainability-related construct was introduced by Elkington [47] and the construct became significantly more well known when the word "sustainable development" appeared in the Brundtland Report in 1987 [24], p. 41). Precisely, the economic indicator evaluates the bank's operational efficiency including its profitability and long-term viability while the environment metric gauges the influence of the bank's operational activities on the environment. Lastly, the inculcation of social indicators assesses the impact on social concerns like community involvement, diversity and equity, and the rights of employees [14].

Today, banks are scrambling to exploit dig-techs to improve operational efficacy and customer experiences while contributing to sustainability [28, 32]. They cannot prosper and endure in this dynamic ecosystem if they are oblivious to how their actions influence the sustainability of their operations [10]. In this regard, green innovation may also be propagated by the digital transformation of commercial banks by increasing R&D spending and minimizing agency costs [84]. Holistically and comprehensively, the implementation of dig-tech induces innovation, reduces information asymmetry,

presents job opportunities, and stimulates economic growth. Furthermore, the researchers pointed out that the financial industry can accomplish remarkable operational efficiency and effectiveness by embracing new technologies, leading to sustainable development. This, in turn, creates an opportunity to innovate value propositions, business models, and value chains, while forging new relationships between financial institutions and their customers [87]. From this point forward, we can assert that digitalization, digital technologies, and digital transformation have a lot of potential for an organization's environmental, economic, administrative, and social sustainability [50].

Previous researches

Research methodology

Selection of database

The first step of data collection encompasses a suitable source for a systematic search of the literature [3]. Our literature analysis relies on Scopus and Web of Science (WoS) Core Collection databases due to their profound, global coverage and frequent updates [27], widely used for conducting literature searches [70]. Additionally, these databases are regarded as the two prominent multidisciplinary bibliometric databases for field delineation [117] and they are differentiated due to the high standard of reported documents [106]. However, an additional rationale for the dataset selection may be found in Melo et al. [91] study.

SLNA framework

Presently, systematic literature network analysis (SLNA) [34, 117] is the methodology adopted to evaluate and examine the papers (see Fig. 2). The SLNA methodology consists of two fundamental phases. Firstly, a systematic literature review (SLR) enables the defining of the parameters of the study and producing studies that will be used as input for the subsequent phase. Typically, the characteristics of openness, inclusivity, explanatory nature, and heuristic nature of SLR set it apart from other literature review approaches and these aspects allow for better objective assessment of search results and the removal of any prejudice and discrepancies [37].

The second phase comprises a quantitative technique, bibliometric, generating representative summaries of a substantial volume of bibliographic material [22, 107]. The two primary techniques of performance analysis and scientific mapping are integrated into the bibliometric study. A spatial representation of the relationships between different scientific actors is provided by science mapping analysis [57], while performance analysis looks at how research constituents contribute to a specific field of study [41]. In the body of existing work, bibliometrics

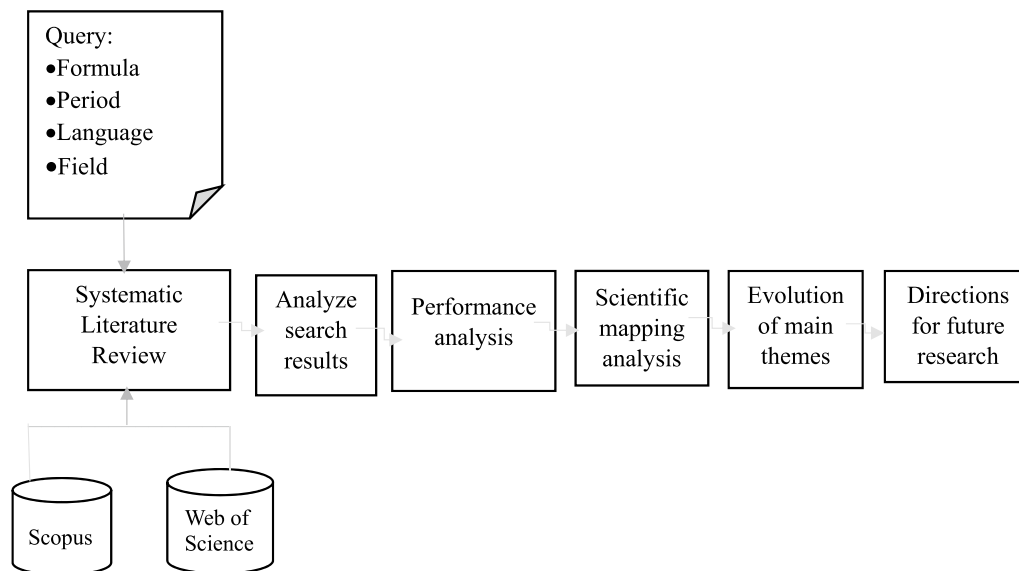


Fig. 2 Research methodology based on the SLNA framework. Source: Authors

has been extensively applied to examine subjects [17], publications [40], universities [92], and countries [86].

Research strategy database searching

After performing the preliminary search of pertinent literature, we have developed strings encapsulating keywords to meet our RQs. The whole search is dominated by three keywords: digital technologies, sustainability, and banking. The addition of an asterisk to the terms "digital," "sustainab*," and "bank*" provides access to a wider cohort of research. For this, an advanced search tool was utilized to comprehend a list of keywords that must only be used in the English language by limiting the search to "titles, abstracts, and/or keywords." Following that, the author has established criteria for paper inclusion and exclusion (see Table 2) to enhance the quality of

the papers and reduce the possibility of adding false positives. In particular, this study has excluded documents such as conference papers, notes, letters, short surveys, and book chapters as they are not subject to the rigorous peer-review process. The data was further refined by excluding papers that do not match with social sciences, business, management and accounting, and economics domains (Table 2).

Data extraction process

This study has applied the Liberati et al. [81] PRISMA framework to conduct a stepwise assessment of the data to streamline the data. The first step yielded 266 and 388 matches, from the WoS and Scopus databases, respectively, after incorporating the inclusion criteria listed in Table 3. After the search, the results from the WoS and Scopus

Table 2 Search and inclusion criteria

Criterion	
Search keyword string	"digital*" OR "artificial intelligence" OR "blockchain technology" OR "cloud computing" OR "mobile wallets" OR "process automation" AND "sustainab*" OR "triple bottom line" OR "TBL" AND "bank*"
Databases	Scopus: (https://scopus.com), (accessed on: 8th February 2024) Web of Science: (https://webofscience.com), (accessed on: 4th February 2024)
Document Type	Articles, review article
Subject area	Business Management and Accounting Economics, Econometrics, and Finance Social Sciences
Category	Title, Abstract, and Keywords
Source type	Journal
Language	English

databases were exported as text and bib files, respectively, so that the databases could be merged and the duplicates could be removed using R software. Subsequently, during the screening and eligibility process, 50 duplicate documents were eliminated to avoid potential repercussions, and 450 documents were excluded at this stage. These 450 documents were eliminated as they were inconsequential, redundant, had little bearing on our research, or needed extensive justifications. Only articles about sustainability from dig-techs in the banking sector were shortlisted to ensure the inclusion of relevant articles. Lastly, the final dataset of 154 documents was included in the Bibliometric system after the data was modified for format compliance. However, the methodical process of identifying pertinent research studies is presented in Fig. 3.

Selection of bibliometric tool

Our research makes use of the biblioshiny package within the bibliometrix tool available in R Studio to perform science mapping and performance analysis [120], developed by Aria and Cuccurullo [13]. While bibliometricians can use an assortment of software tools to examine or display the data, their selectivity of tools depends on the kind of analysis needed for the study [38]. Bibliometrix is an open-source program designed for extensive mapping analyses in the scientific domain. It is capable of continual development and can be integrated with other statistical R software. Consequently, it has great acceptance among users and gains significant relevance in the rapidly changing disciplines of descriptive, network, and bibliometric analysis [127]. Data can be imported, converted to a data frame, filtered, analyzed, and plotted for sources, authors, and documents with simplification using the Biblioshiny Web interface for Bibliometrix [51].

Results

Performance analysis

Data set

A summary of the scholarly article production of data spanning from 2012 to 2024 is presented in Table 4. This table showcases that 154 articles were published by 437 authors published in 90 sources with 2.36 average years from publication. The annual publication growth rate is 5.95% while the average number of citations per document was 11.47. According to the findings, 16 documents have been authored by a single author. Additionally, the rate of international co-authorship is 20.13%. Out of 154 documents, more than 95% of articles and less than 5% of reviews constitute our research area.

Annual scientific production and total citations per year

Figure 4 depicts the research trend of Scopus and WoS publications explicitly integrating sustainability and

dig-techs in the banking area. The initial research trend implies that period I (2012–2017) is a consistent period where the number of publications is relatively rare. No articles were published in 2013, 2014, 2015, and 2016. This indicates that the field is in its nascent stages and has gradually piqued the interest of scholars as substantiated by a noticeable surge in publications, particularly after 2018. Period II (2018–2020) was defined as a transitional phase characterized by an upsurge in the number of publications, this period observed the highest citation peak of 188 in 2018 indicating a burgeoning trend in the subject matter (see Table 5). Most of the researchers during this period emphasized banking automation, AI regulation, financial inclusion through digital transformation, mobile payments, sustainability reporting, and risks in banking service digitalization in their scientific publications. During period III (2019–2023), there has been an exponential growth in the generation of scientific knowledge accounting for about 77.92% of all publications. This significant surge of scholarly interest has led to the manifold growth of a substantial body of literature and the further establishment of search equations in academic institutions. Period III stipulated an exhaustive examination of concepts such as blockchain technology, Central Bank Digital Currency (CBDC), fintech, sustainable banking, cloud computing, digital currency and its aftermath. However, it seems evident from Table 5 that the average number of citations seems to have been on a downward trajectory post-2020. This may be because citations to recent publications are typically lower than those to older ones. Ultimately, records from 2024 are incorporated in a different time as period IV (2024) since the number is only a portion of the current research development. The majority of published work endeavors to advance definitions, foundational knowledge, theoretical underpinnings, and conceptualizations of banking digital transformation.

Analysis of most productive authors and countries

Table 6 outlines the significant contributions made by eminent authors and countries to the scientific production of our research. Particularly, Forcadell. F and Aracil E. (TC: 89) hold the leading position as the most prolific authors in terms of citation performance followed by Ahmad N. (TC: 72) for the second position and Alonso S. and Forradellas R. tied up for the third slot (TC: 58). Further, Forcadell et al. [53] acknowledged that banks can enhance their market and economic performance by leveraging digitalization to address the issue of asymmetric information. Unexpectedly, hardly three publications have been published by influential authors, suggesting that the research field is still in its infancy and necessitates author collaboration.

Table 3 The intersection of three underlying concepts in various disciplines

Authors	(1)	(2)	(3)	(4)	(5)	(6)	Methodological approach	Concepts discussed
Aljumah [9]	Social	✓					Partial least-square structural equation modeling (PLS-SEM)	Business ethics, corporate social sustainability, trust, community, social integration
Anjum [12]	Economic and social		✓				Multi-Criteria Decision Making (MCDM)	IT risk management, private cloud, operational business intelligence, sustainable hedging
Cavus et al. [26]	Economic and social	✓					Artificial neural network (ANN) and structural equations modeling (SEM)	Artificial neural network, mobile banking apps, mobile devices, security and privacy issues
Chatterjee et al. [29]	Economic, social, and environmental	✓	✓				PLS-SEM approach	Production system sustainability, technology turbulence, firm performance, operational sustainability
Cho et al. [31]	Economic			✓			Time series analysis	Customer responses, self-service channel innovation resistance, TAM model, fintech development, multi-channel banking
Lăzăroiu et al. [79]	Environmental and social	✓	✓	✓			Quality tools: AXIS, Eppi-Reviewer, PICO Portal, and SRDR	Sustainable finance, financial crime, financial technology, green innovation, mobile banking
Li et al. [80]	Economic and environmental			✓			SPSS macro program (Process)	Digital supply chain platforms, Industry 4.0, Environmental dynamism, manufacturing firms
Hasan et al. [64]	Economic and social				✓		Exploratory factor analysis and structural equation modeling	Sustainable mobile payments, privacy norms, behavioral intentions
Hwang and Kim [68]	Economic	✓					Analysis of covariance (ANCOVA)	Telemarketing, virtual assistant technology, AI-based chatbot system, voice recognition and conversion model, financial sustainability, profitability indicators
Semenova et al. [112]	Economic, social, and environmental				✓	✓	Analytic hierarchy process (AHP)	Absolute stability, sustainability assessment, technological sustainability, unstable state, institutional sustainability
Veliyeva [124]	Economic and social	✓		✓	✓		Literature review	Innovation, customer focus, mobile technology, competitive advantage, economic growth, sustainable development
Vrontis et al. [126]	Economic and social	✓	✓				PLS-SEM technique	SME performance, value creation, big data analytics, social and economic value creation, entrepreneurial orientation
Yang et al. [128]	Environmental	✓	✓	✓			Panel data analysis	Knowledge management perspective, upper echelons theory, textile and apparel industry, top management team technical background
Zuo et al. [132]	Economic	✓	✓	✓	✓		DEA Malmquist index method	Technical efficiency, fintech, total factor productivity, digitalization infrastructure, scale efficiency, dynamic efficiency

(1 = Sustainability dimensions, 2 = Artificial intelligence, 3 = Blockchain technology, 4 = Cloud computing, 4 = Mobile wallets, 5 = Process automation)

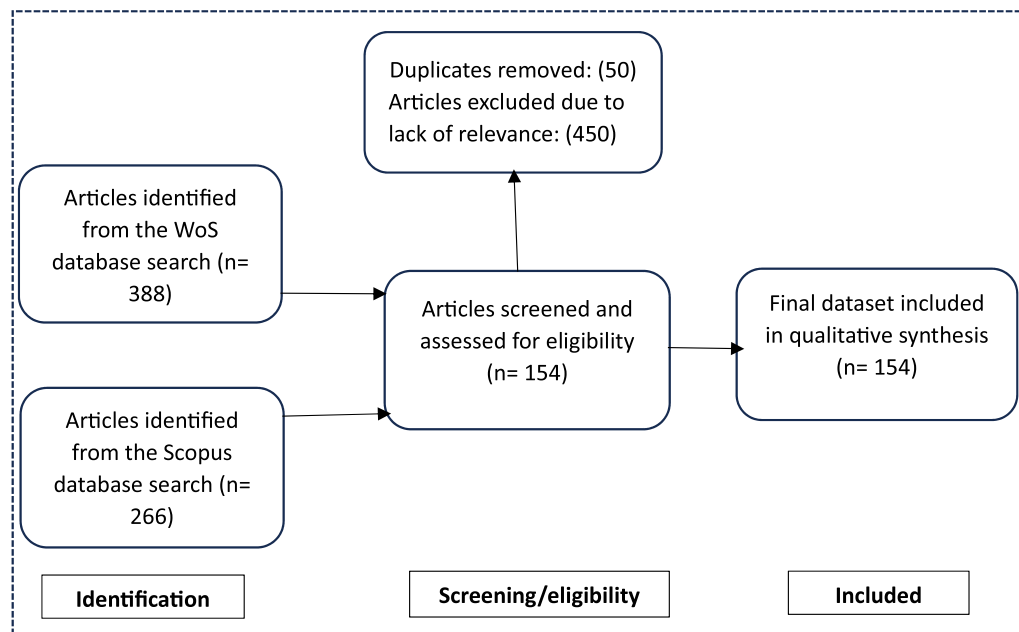


Fig. 3 Data collection flowchart. Source: Authors compilation

Table 4 Primary information of data

Main information about the data	
Time Horizon	2012:2024
Total Documents	154
Annual Growth Rate %	5.95%
Keywords Plus (ID)	397
Authors	437
Sources	90
Average years from publication	2.36
Average citations per document	11.47
Co-authors per document	3.2
Single-authored documents	16
International co-authorships %	20.13
Article	147
Review	7

Our research study involved contributions from academicians and scholars from 51 different nations; however, there is a noticeable geographic imbalance in this knowledge base. The overwhelming majority of publications come from the following six countries: China ($n=51$), Spain ($n=24$), India ($n=23$), UK ($n=16$), Malaysia ($n=14$), and Indonesia ($n=12$). Nevertheless, two of the most technologically and digitally proficient nations, such as China and India, share a strong commitment to sustainable development and BIM initiatives [82] which matches their escalating trend of publication from period III, since 2019. Surprisingly, till now, just three

publications have been produced by nations including Qatar, Iran, France, Germany, Iraq, Russia, and Sri Lanka. This is a gap that should not be overlooked, especially in light of the potential advantages that digital transformation may bring about in terms of changing business procedures and the way banks operate [102].

Bibliometric data also uncovered that China and Italy leading the rest of the world in terms of citation performance followed by Spain, Egypt, and Malaysia. However, Fig. 5 demonstrates that authors from China dominate the study in the single country publications (SCP) parameter. Subsequently, Malaysia achieved the highest percentage in multiple country publications (MCP), followed by Korea, Italy, Romania, Egypt, Pakistan, the UK, and Bahrain.

Prominent sources and origin dynamics

The top ten most referred journals are listed in Table 7. Out of the 154 articles that were analyzed, approximately 25% of the publications have been contributed by a journal “Sustainability” with a total of 38 articles and 470 citations worldwide. The second most influential source is the journal “Sustainability (Switzerland),” which has contributed 11 publications, accounting for about 7.14% of the review. Interestingly, the top 10 journals comprise 44.80% of all the articles analyzed. Notwithstanding their combined two contributions, “Kybernetes” and the “International Review of Financial Analysis” have shown stronger citation success. However, determining the most impactful journals is crucial for researchers to select the

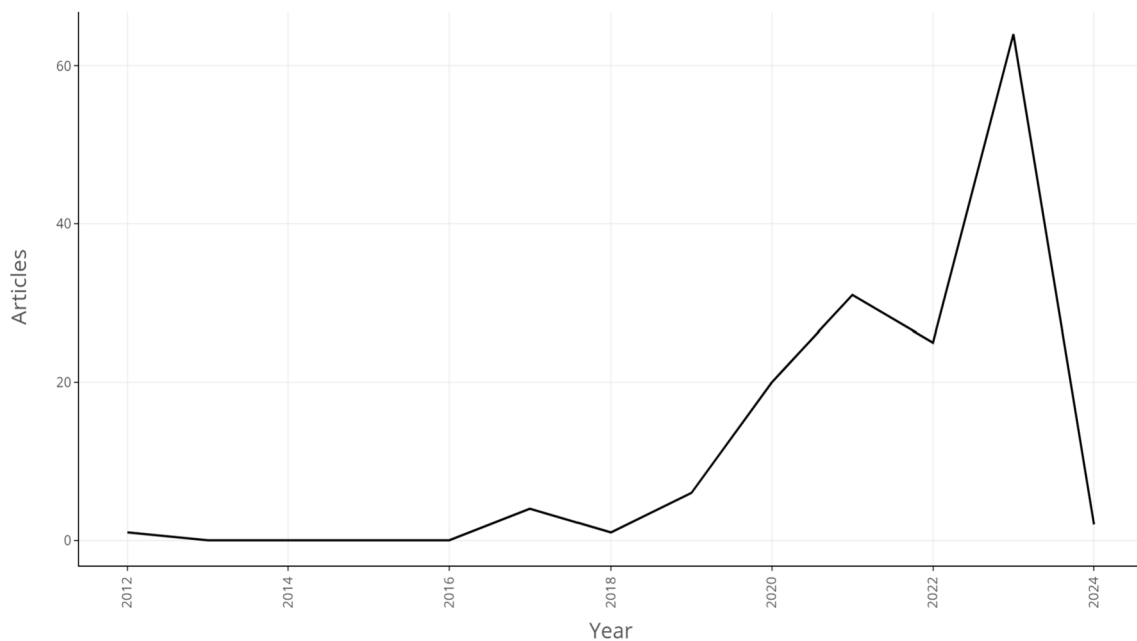


Fig. 4 Annual scientific publications by years

Table 5 Annual total citations per year (2012–2024)

Year	MeanTCperArt	N	MeanTCperYear	Citable years
2012	52	1.00	4.00	13
2017	36.5	4.00	4.56	8
2018	188	1.00	26.86	7
2019	13.83	6.00	2.31	6
2020	25.75	20.00	5.15	5
2021	12.94	31.00	3.23	4
2022	8.76	25.00	2.92	3
2023	2.52	64.00	1.26	2
2024	1	2.00	1.00	1

Table 6 Most productive authors and countries

TC	Author	TP	TC	Countries	TP
58	Alonso S	3	298	China	51
89	Aracil E	3	179	Italy	8
12	Dwivedi Y	3	127	Spain	24
89	Forcadell F	3	116	Egypt	5
58	Forradellas R	3	106	Malaysia	14
26	Zuo L	3	81	UK	16
17	Barjaktarovic L	2	68	South Korea	9
72	Ahmad N	2	61	Indonesia	12
37	Alam M	2	29	India	23
20	Ali M	2	28	Romania	11

TC total citations, TP total publications

best publication source. Perhaps, published papers in esteemed journals stimulate interest in further research [2] and denote advancements in the field of study [75]. The examination of journal frequency over time in Fig. 6 indicates some intriguing tendencies. It exemplifies the cumulative publications from 2012 to 2024 for the dominant five sources. Notably, the initial publication on banking dig-techs’ influence on sustainability surfaced in 2012 in the *Journal of Sustainability* (Switzerland) with a significant rise in 2019. This reflects the mounting prominence of this source in the academic literature and its emphasis on sustainability and its aftermath.

Three-field plot

Sankey plots are used in the three-field plot (Fig. 7) to depict the relationship between the fields, where the size of the component is proportionate to the value of the node [71, 110]. Sources are arranged on the left, authors are positioned in the middle, and keywords selected for analysis are organized on the right in the Sankey Plot. Each of the twenty items demonstrated well-known terminologies such as sustainability, financial inclusion, sustainable development, digitalization, fintech, and financial technology alongside their sources and highly recognizable authors. All twenty significant publications addressed the theme of digital technologies," indicating how crucial it is to the sustainable development of the banking sector.

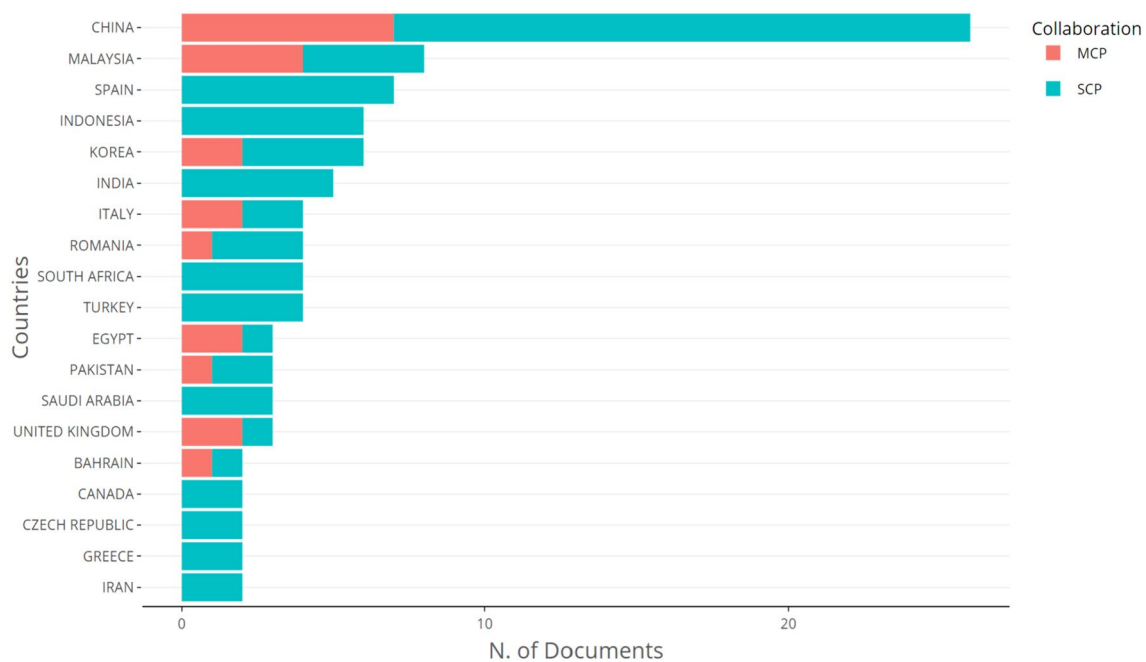


Fig. 5 Corresponding author's countries

Table 7 Productivity of journals based on publications and citations

Source	Publisher	TC	NP	h	g	m	PY_start
Sustainability	MDPI	470	38	12	21	1.5	2017
Sustainability (Switzerland)	MDPI	134	11	6	11	1.2	2020
Amfiteatru Economic	Bucharest University of Economic Studies Publishing House	29	2	2	2	0.25	2017
Banks and Bank Systems	Business Perspectives	10	3	2	3	0.667	2022
Finance: Theory and Practice	Financial University under The Government of Russian Federation	8	4	2	2	0.5	2021
International Journal of Bank Marketing	Emerald Group Publishing Ltd	12	3	2	3	1	2023
International Review of Financial Analysis	Elsevier Inc	94	2	2	2	0.4	2020
Journal of Business Research	ScienceDirect	20	2	2	2	0.5	2021
Kybernetes	Emerald Group Publishing Ltd	42	2	2	2	0.25	2017
Academy Of Entrepreneurship Journal	Allied Academies	10	2	1	2	0.2	2020

This table presents the top 10 prominent journals along with their publisher's name. It also lists the number of publications (NP) of the journal constituting this study and its total citations. The four remaining columns represent the impact of the journal as an h-index (h), g-index (g), m-index (m), and the production year started (PY)

Analysis of Influential articles

According to performance analysis results, the most influential document is Yip & Bocken [129] accredited with 188 citations, followed by ElMassah and Mohieldin [49] with 109 citations illustrated in Table 8. In their study, Yip & Bocken [129] focused on developing and validating eight sustainable business model archetypes for the banking sector through semi-structured interviews. Along with that, questionnaires were also designed to gauge customer receptiveness to the archetypes. The authors advocated that business adoption of a specific

sustainable business model(s) is heavily influenced by the economic component of the TBL of sustainability. Further, ElMassah and Mohieldin [49] explored multiple case studies of the use of big data and e-government in seven different countries throughout the world. They concluded that digital transformation elevates the tendency to achieve sustainable development goals (SDGs). Giungato et al. [61] authors further embellished that bitcoins as a virtual currency have the potential to be environmentally sustainable since in contrast to conventional payment or banking systems, they require fewer natural resources

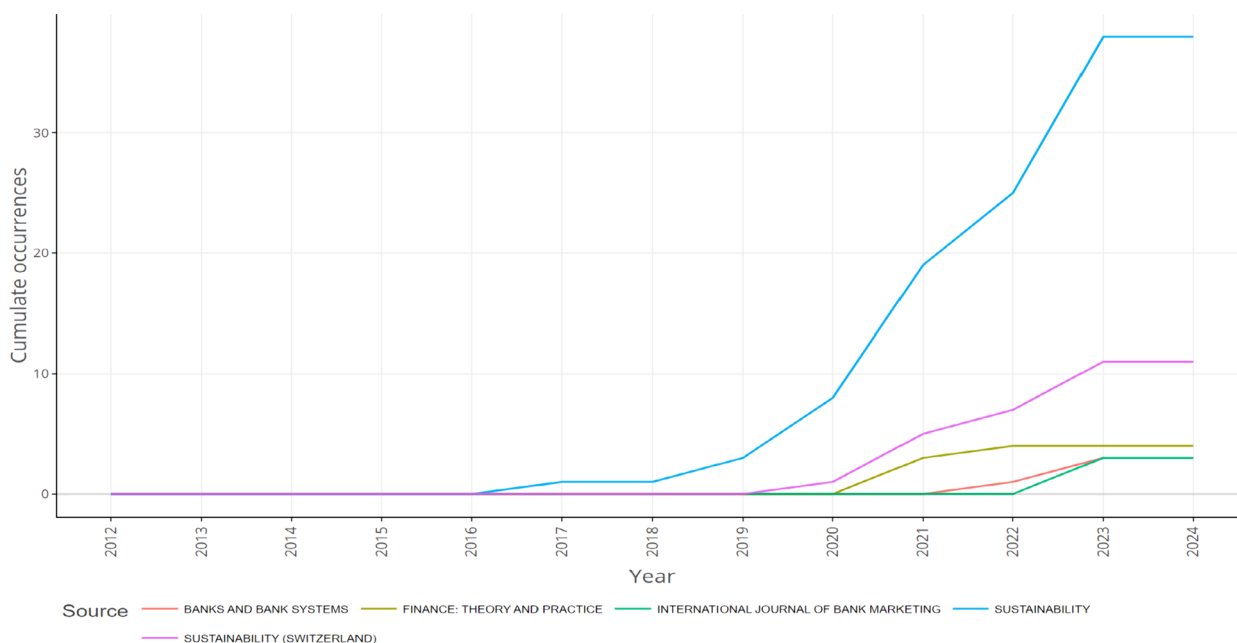


Fig. 6 Source growth

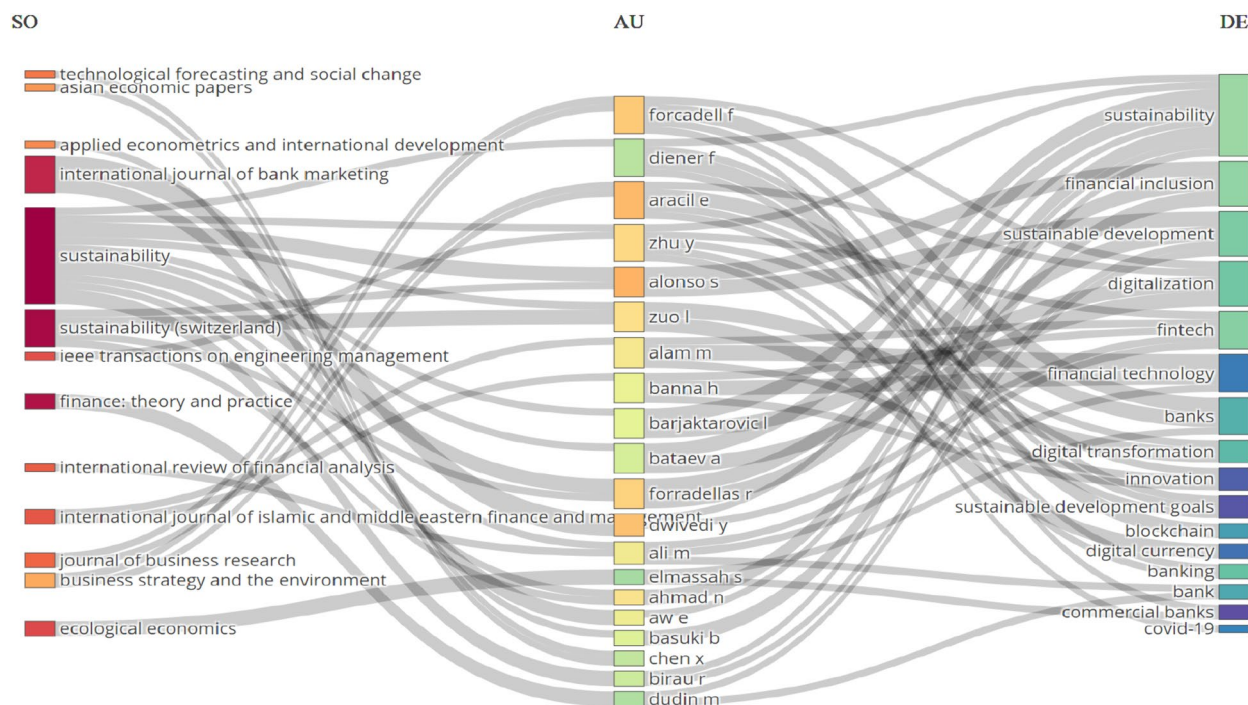


Fig. 7 Three-field plot

(such as fossil fuels) to support and maintain their value exchange system. While bitcoin can be used by hackers and for fraudulent activities or by criminal associations to trade narcotics, guns, etc., some skepticism over its social sustainability has been addressed. Besides, the banking

sector has harnessed AI to integrate chatbots into their customer care operations to strengthen customer satisfaction and cultivate sustainable development according to Nguyen et al. [99]. In this regard, [62] reported that the chatbot market which was valued at USD 430.9 million

Table 8 Most globally cited documents

Authors	Title	Journal	TC	TC per Year	Normalized TC	Altmetrics
Yip and Bocken [129]	"Sustainable business model archetypes for the banking industry"	Journal of Cleaner Production	188	26.86	1.00	17
ElMassah and Mohieldin [49]	"Digital transformation and localizing the Sustainable Development Goals (SDGs)"	Ecological Economics	109	21.80	4.23	508
Giungato et al. [61]	"Current Trends in Sustainability of Bitcoins and Related Blockchain Technology"	Sustainability	98	12.25	2.68	18
Murinde et al. [97]	"The impact of the FinTech revolution on the future of banking: Opportunities and risks"	International Review of Financial Analysis	78	26.00	8.90	12
Kauffman and Riggins [73]	"Information and communication technology and the sustainability of microfinance"	Electronic Commerce Research and Applications	52	4.00	1.00	25
Amidjaya and Widagdo [11]	"Sustainability reporting in Indonesian listed banks: Do corporate governance, ownership structure and digital banking matter?"	Journal of Applied Accounting Research	50	10.00	1.94	27
Ahmad et al. [4]	"CSR Communication through Social Media: A Litmus Test for Banking Consumers' Loyalty"	Sustainability	50	12.50	3.87	229
Munkhdalai et al. [96]	"An Empirical Comparison of Machine-Learning Methods on Bank Client Credit Assessments"	Sustainability	48	8.00	3.47	73
Moro-Visconti et al. [95]	"Sustainability in FinTechs: An Explanation through Business Model Scalability and Market Valuation"	Sustainability	46	9.20	1.79	385
Nguyen et al. [99]	"Determinants of Continuance Intention toward Banks' Chatbot Services in Vietnam: A Necessity for Sustainable Development"	Sustainability	45	11.25	3.48	115

This table enlists the 10 most frequently cited articles along with their title, source name, author name, year of publication, total citations, normalized TC, and altmetrics of the article

in 2020 is projected to increase at a compound annual growth rate of 24.9% from 2021 to 2028, reaching USD 2.486 million.

Analysis of keywords

The literature provides several pertinent keywords emphasizing the value of the field study. Therefore, it is feasible to comprehend the study field's breadth as well as its depth by using keyword analysis [71]. Referring to Fig. 8, a word cloud is a visual representation of the frequency of words where the size of each word denotes how frequently it appears within a document [127]. The word cloud results disclose that sustainability, financial inclusion, sustainable development, digitalization, fintech, and digital transformation were the most frequently used keywords as evidenced by the thickness of the keywords in Fig. 8 (minimum 50 occurrences). Furthermore, "sustainability" constitutes 10% of total

keywords, followed by financial inclusion 7%, fintech 6%, sustainable development 6%, digitalization 5%, and digital transformation 4%. This word cloud implied that previous research studies had examined digitalization as a potent tool for enhancing financial inclusion [119] by making financial services more accessible which ultimately aids in the achievement of sustainable development goals (SDGs) [60, 105]. Besides, the banking and financial sectors leverage technologies like artificial intelligence, blockchain technology, machine learning, and information technology to better incorporate sustainability matrices into investment decision-making.

Trend topics

Figure 9 represents the proliferation of the most popular titles on a two-dimensional scale. On the horizontal axis, the degree of occurrences has been plotted against the years of publication. In 2021, digitalization and financial



Fig. 8 Word cloud of keywords

inclusion were prominent subjects. In 2022, 2023, and 2024, the focus swiftly turned to digital transformation, sustainable development, blockchain, and fintech. This dramatic change is the result of the Central Bank Digital Currency, a new development in the field of digital finance that makes use of blockchain technology.

Scientific mapping analysis

Co-occurrence network of keywords

According to Huang et al. [67], keywords are widely used to ascertain the central topics, subject matter of studies, and technology/methodology used in a given discipline. To assess and examine the distribution of noticeable keywords, we have employed co-occurrence networks in our study. Co-occurrence refers to the statistical relationship between different terms appearing in the same text [67]. Many factors, especially the field, network architecture, normalization, and clustering technique, form the basis of the co-occurrence network. Further, the optimal configuration is selected automatically for graph readability [66]. The keyword co-occurrence network observed in Fig. 10 was constructed for the study's author's keyword by applying Louvain's clustering technique with 50 nodes. The automatic layout and default settings for normalization by association were employed to build the network. The colors of individual clusters signify relatedness, words indicate the vertex, distance implies relatedness, and the size of a node is proportionate to the number of nodes in the cluster. The thickness of the lines connecting nodes represents the number of times the two authors' keywords occur together [130]. We characterized these keywords under five different clusters.

Cluster 1: Digitalization and sustainability (red)

The first cluster is dominated by keywords like sustainability, digitalization, fintech, blockchain, and banking. Within this framework, a substantial body of literature drawing attention to how higher sustainability standards are an outcome of digitalization, accentuating the positive interdependencies between these two megatrends [23, 35, 44, 45, 77, 82]. Over the past ten years, the average total factor growth in productivity of commercial banks climbed by 10.7% due to advancements in technology and technical efficiency according to Zuo et al. [132]. A sustainable development path and exacerbated operational efficiency and effectiveness of financial institutions are made possible by the adaptation of the collaborative dig-techs landscape within the financial sector [87]. Mishra and Kaushik's [93] research also posited that blockchain technology has enormous possibilities to dramatically reduce transaction costs, overhead costs as well as the costs associated with mistrust thereby disrupting the banking industry.

Cluster 2: financial inclusion and sustainable development (blue)

The esteemed researchers in this particular cluster dedicated their efforts to exploring keywords focused on financial inclusion, Central Bank Digital Currency, and sustainable development (among other keywords). Delving deeper into the literature, previous research has meticulously investigated CBDC with financial inclusion [109] and financial inclusion with sustainable development [60, 105]. Blockchain-based CBDCs can act as a powerful impetus for developing countries with ample unbanked populations considering they are expected

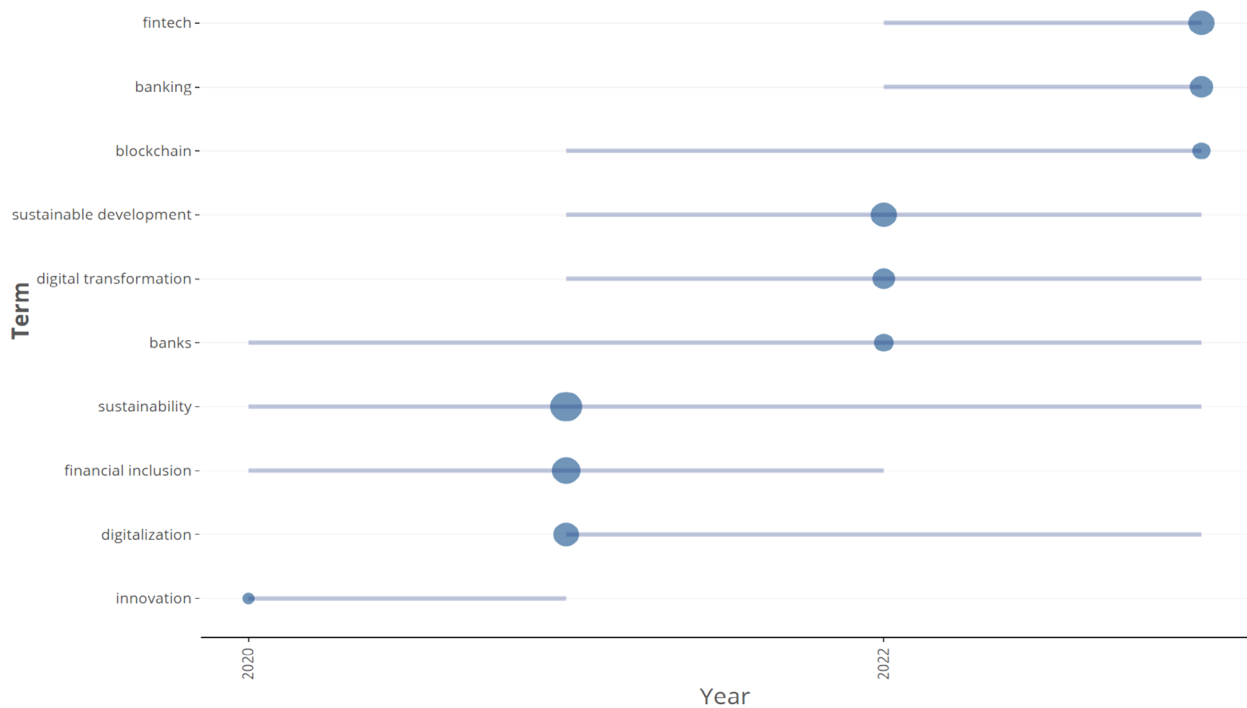


Fig. 9 Trending topics

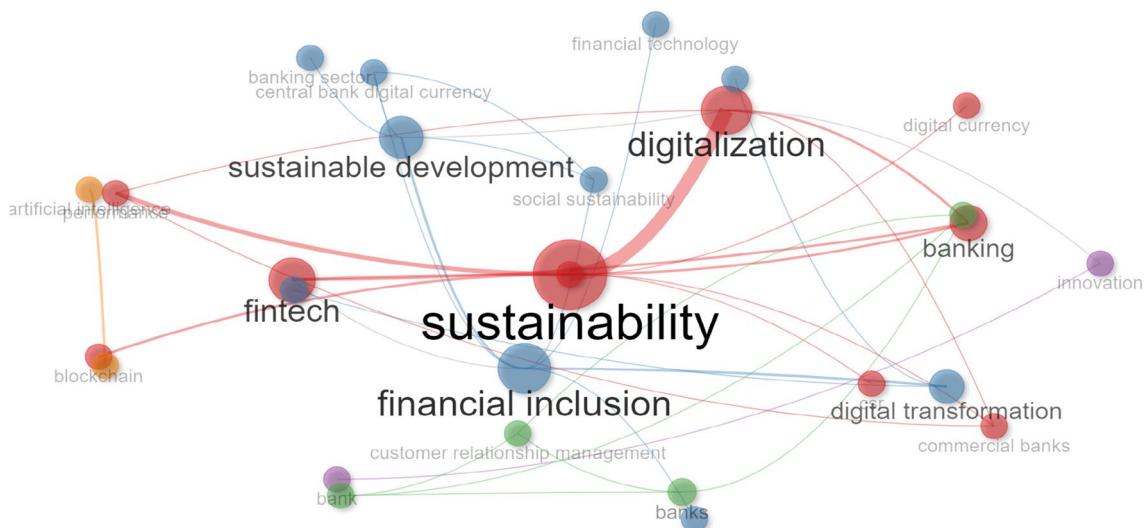


Fig. 10 Co-occurrence network

to expand financial inclusion [52, 103] which eventually reduces income inequalities and facilitates the accomplishment of SDGs [60, 105].

Cluster 3: information technology and customer relationship management (CRM) (green)

The third cluster revolves around the pressures placed on the banking sector to employ effective information

technologies to surpass and sustain customer satisfaction [1]. The harnessing of progressive technologies by banks has enabled them to prioritize efficiency, speed, and high operational capacity, leading to an elevated standard of CRM according to Mistrean [94]. The substantial upsurge in transparency can be seen from the proliferation and implementation of collaborative technologies which have further caused the CRM to gradually change from being

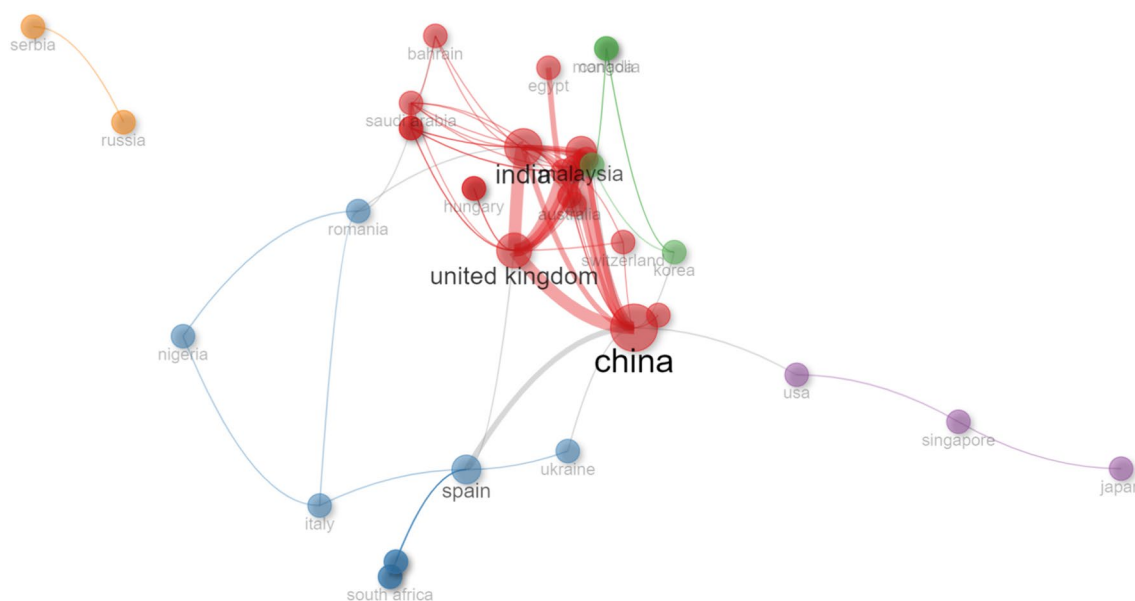


Fig. 11 Most collaborative countries

solely a front-office or sales force automation tool to a customer-centric process [42].

Cluster 4: banks and innovation (purple)

Presently, regulators are investigating the multiple points of convergence between financial services and technological innovation [121]. Nevertheless, the empirical analysis by El Hilali et al. [46] purports that the pursuit of sustainability by firms is significantly influenced by three factors that should be prioritized during a digital transformation stage: customers, data, and innovation. However, the pursuit of efficiency and sustainability in contemporary business practices is predicated on the deployment of innovative technological solutions. As such, innovation plays an indispensable role in driving sustainable growth and optimizing organizational efficiency [87].

Cluster 5: artificial intelligence (AI) (orange)

Lastly, the fifth cluster reinforces the emerging interest in cutting-edge technologies like “artificial intelligence” and “machine learning.” The financial industry may witness a significant disruption from AI-based cognitive computing that leverages a wide range of data and information sources. Specifically, AI holds promise for mitigating cyber risks, streamlining credit assessments, augmenting fraud detection, ameliorating regulatory compliance, and enriching investment decision-making. For this, it is critical to assess AI’s efficacy in terms of accuracy, dependability, and scalability to meet these goals. Only then can the financial industry leverage AI to its full potential and reap the benefits of this transformative technology [121].

Collaboration network of countries

Intellectual networking or collaboration has grown customary in the face of increasing theoretical and methodological complexity in research [7]. In this context, Fig. 11 reflects research on an international collaboration that was produced by authors from 36 different nations. This network for the countries is produced by applying the Leiden clustering technique with 50 nodes and there are five clusters within the country’s collaboration network, revealing the degree of their interdependence. These clusters demonstrate betweenness and closeness centrality. Collaboration network metrics extensively employ the betweenness and closeness centrality [54].

In Cluster 1, China occupied a pivotal place in the collaborative network and was the most collaborative nation, primarily collaborating with the most productive nations, such as India, and the UK. Cluster 2 displays the highest betweenness with Malaysia followed by Vietnam from Cluster 3. Further, USA dominates the cluster 4 and Serbia collaborates with only Russia in Cluster 5. These clusters point out the emergence of many European nations and their proximity to one another. Surprisingly, emerging countries such as Iran, France, Germany, and Iraq did not give glowing representation on this subject. Nevertheless, massive international collaboration in research will encourage the development of a more structured, globalized, sophisticated, and articulate research network. Consequently, there is a need for stronger research collaboration across different countries.

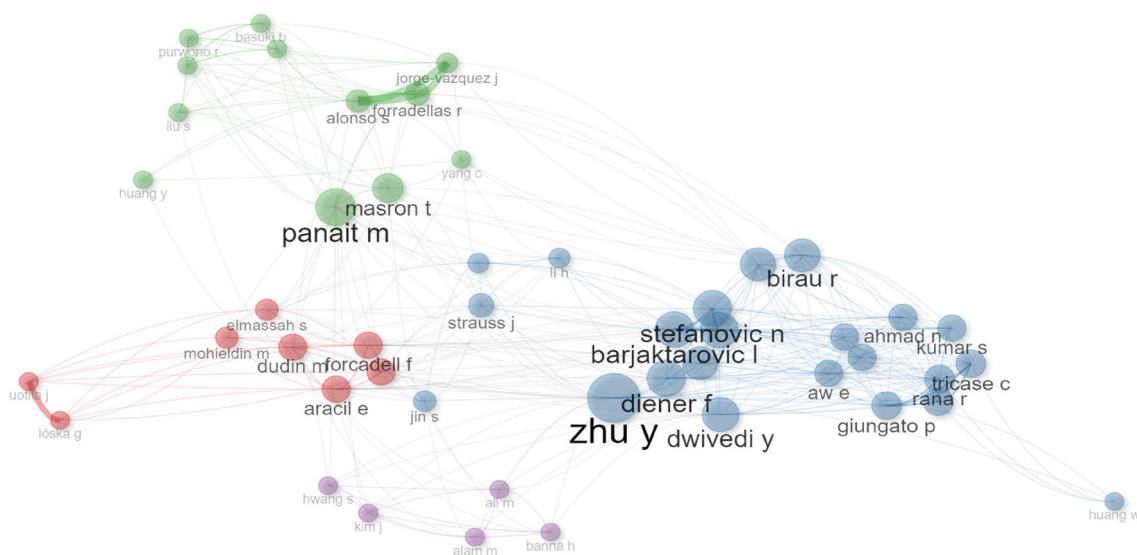


Fig. 12 Bibliographic coupling of authors

Bibliographic coupling map analysis of authors

Two articles are considered bibliographically connected if the reference lists of both articles include at least one cited source [13, 72]. In this case, the author’s references to the publications throughout the composition of the article are indispensable [71]. The bibliographic coupling of authors is portrayed in Fig. 12, where the size of each node denotes the number of citations for each article. The degree to which nodes or articles are bibliographically linked is indicated by the proximity or distance of the studies inside the network, according to Niknejad et al. [100]. The analysis resulted in four clusters as shown in Fig. 12. The prominent authors from the red cluster include ElMassah S, Forcadell F, Aracil E, and Mohieldin M; the blue cluster includes Stefanovic N, Sharma A, Zhu Y, Bariaktarovic L, Diener F, and Dwivedi Y; the green cluster includes Panait M, Masron T, and Yang C; and finally, the purple cluster includes Alam M and Banna H.

Conceptual structure map

The conceptual structure map deploys regional mapping to explicate the relationships between the words to visualize the integral structure of the words that are frequently entailed in journals and papers on sustainability impact from dig-tech in banking. Figure 13, the Conceptual structure, draws on multiple correspondence analysis (MCA) to describe two major dimensions of the author’s keyword field [83]. Words are positioned according to Dim1 28.72% and Dim2 18.53%, where Dim is the diminutive particle. It is a term from the scientific field of bibliometrics that generates related words with little to no variation from one another. The map below has been partitioned into two sections, the red area and the blue area,

and interrelated words are grouped. The red section listed below has a greater diversity and number of words, illustrating the connection between the words used in multiple research publications. Overall, machine learning, blockchain technology, digital currency, digital economy, fintech, digitalization, innovation, artificial intelligence, financial technology, information technology, CBDC, digital banking, digital finance, industry 4.0, green banking, profitability, and its aftermath are observed to be the robust drivers for sustainable development in the banking sector. Nevertheless, words that are positioned apart share tenuous connections, whereas those that are positioned contiguous to one another share strong relationships and are mentioned in papers together.

Thematic map

The research themes, significant expressions, and connections between them are provided by thematic mapping of keywords [6]. These themes are derived from the thematic analysis of author keyword clusters and property values (density and centrality) define these themes explicitly. The vertical axis characterizes density, whereas the horizontal axis represents centrality [56]. The internal keyword connectivity predicts the density reflecting the degree of theme development whereas centrality is defined by the external relationships between the keywords, signifying the relevance of the themes [21]. A bubble on the map symbolizes each theme in Fig. 14. The mechanism of thematic mapping divides the body of research into four distinct categories where focused themes are presented in the upper left quadrant (Q3), fading or emerging themes are exhibited in the lower left quadrant (Q4), and underlying themes are highlighted

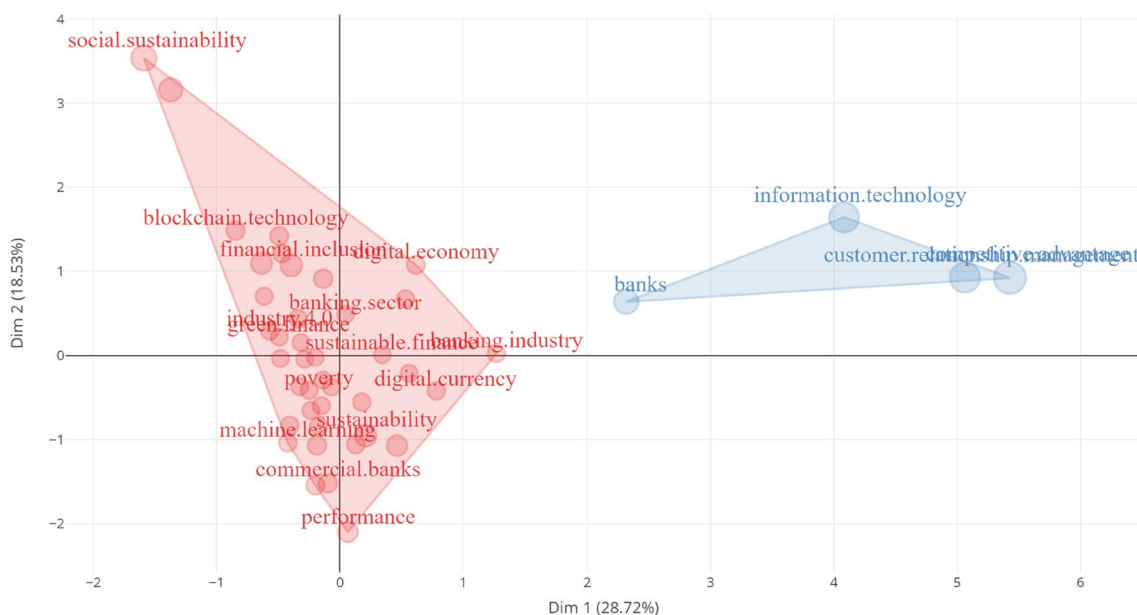


Fig. 13 Conceptual structure map- method MCA

in the lower right quadrant (Q2). Driving themes are expressed in the upper right quadrant (Q1).

On the graph, "bank innovation" and "fintech" from Q2 are fundamental and transversal to the field's development and lay the groundwork. The themes of "financial inclusion," "digital economy," and "sustainable development" act as driving forces behind the introduction of dig-techs for sustainable development into the banking industry in Q2. With low centrality and density scores, the study fields in Q4 are either immature or emerging subjects that require additional development. In that way, digital currency, chatbot, and green finance are the nascent themes covered in this cluster. Finally, the delivery of financial services through artificial intelligence and digital currencies based on blockchain technology exemplifies a niche theme in Q3.

Discussions

The present research has employed SNLA methodology to gauge the influence of published papers in the subject field by statistically evaluating them. Using the R bibliometric tool, we looked over 154 documents spanning from 2012 to 2024 that are indexed in Scopus and WoS databases by using the web-based biblioshiny tool. Our study supplements the literature by examining the scientific output of publications and citations, productive authors, most cited countries, source growth, pertinent documents, and keyword analysis through performance analysis. Meanwhile, scientific mapping uncovered the interrelationship between authors, countries, keywords, and themes. Undoubtedly, scientific production

has climbed dramatically over the last decade with a 5.95% growth rate annually. The study encountered an elevated interest in the subject matter particularly from 2018 onwards, suggesting that the field is still in its nascent stage and calls for an integrated, comprehensive approach. A substantial portion of published work strives to progress conceptualizations, theoretical foundations, definitions, and basic understanding of the sustainable digital transformation of banking. The following prolific authors have published the utmost documents in the field of study (Alonso S., Aracil E., Dwivedi Y., Forcadell F., Forradellas R., and Zuo L.). The overwhelming majority of publications came from the following six countries: China ($n=51$), Spain ($n=24$), India ($n=23$), UK ($n=16$), Malaysia ($n=14$), and Indonesia ($n=12$). Further, China emerged as the most productive country in terms of citation performance and single-country publications, followed by Italy, Spain, Malaysia, and Egypt). Besides, the collaboration network outlines the following nations that are actively collaborating: China, India, the UK, Malaysia, and Saudi Arabia. The study also underlined minimal engagement from developing countries such as Iran, France, Germany, and Iraq. Furthermore, the study also proposes an overview of the influential journals that have published the most articles in the subject field along with the overall citation performance and the h-index of the journals. Out of the 154 articles that were analyzed, approximately 25% of the publications have been contributed by a journal "Sustainability" with a total of 38 articles and 470 citations worldwide. Remarkably, 44.80% of the examined syntheses are published

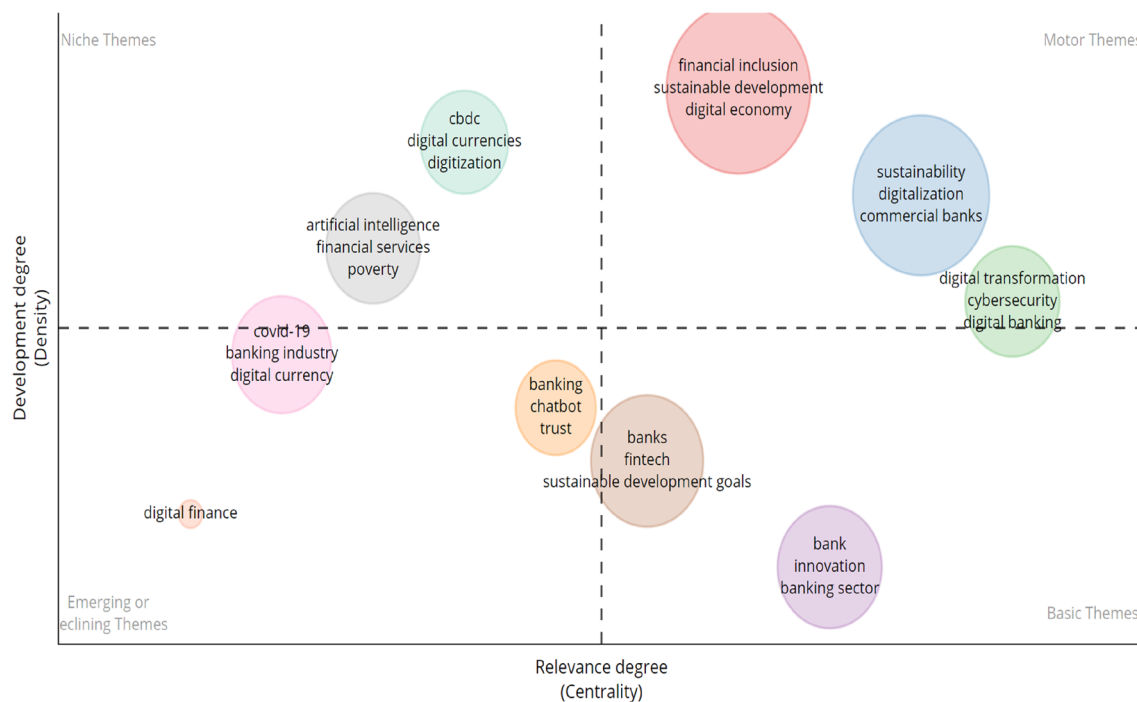


Fig. 14 The basic, motor, niche, and emerging themes

in the top tier 10 journals. The examination of research keyword analysis emphasized digitalization, sustainability, financial inclusion, sustainable development, fintech, and digital transformation as the central elements. More specifically, this study scrutinized the interplay between dig-techs and sustainability and discovered that it is positively associated, which is in line with the literature of other domains that have examined the same relationship [35, 44, 45, 77, 82]. The final layer of our exploration concludes that financial inclusion can act as a mediator in our research field since digitalization acts as a potent tool for enhancing financial inclusion [16, 36, 60, 119] that ultimately aids in achieving the TBL performance of the banking sector [60, 87, 104, 105].

Implications for theory

This study has contributed many insightful theoretical perspectives. Firstly, our predominant theoretical contribution is to deepen the existing reviews on the synthesis of dig-techs that embrace sustainability in the banking industry. While other reviewers have used qualitative approaches, authors may supplement these evaluations by employing an extensive systematic literature network analysis. This will allow us to be more specific about the intellectual advancement and structure of dig-techs. Second, our contribution relies upon pinpointing the subjects that academics are most likely to study in the future by seeing positive and negative trends in subtopic areas (see

Fig. 9). Thus, themes that are connected to digital transformation, sustainable development, fintech, blockchain technology, and CBDC provide a framework for further research and investigation to enrich the literature for academicians and researchers. Third, the analysis of influential papers intersecting three underlying concepts puts concentration on the evolving landscape of innovative dig-techs within the context of TBL sustainability. This interconnection emerged as a dynamic, multidisciplinary, and eclectic research area of global significance. Fourth, this study also offers an intriguing viewpoint for prospective scholars by scientific mapping analysis and highlights the counterintuitive connection between digitalization, financial inclusion, sustainability, fintech, and sustainable development by providing support with recent literature to reflect the current developments in the field. Finally, various sub-themes (cluster 1: digitalization and sustainability, cluster 2: financial inclusion and sustainable development, cluster 3: information technology and customer relationship management, cluster 4: banks and innovation, cluster 5: artificial intelligence) have surfaced from the cluster analysis (see Fig. 10), prompting us to assess the degree of their associations. Therefore, researchers in this field can work with researchers in related fields to establish a shared research pool.

Implications for practice

Researchers interested in capitalizing on the advantages of dig-tech centered in the banking domain have multiple opportunities to select this study. Initially, we applied an extensive number of assessment axes to evaluate 154 literature contributions. These pathways could serve as an informative guide for researchers and management to further replicate the study in their respective fields. Furthermore, the application of SLNA methodology can be customized for specific banking-related technologies that exhibit simultaneous effects on economic, social, and environmental sustainability. In essence, scholars can consolidate and gain insight into how the field of study has evolved by recognizing top outlets, prolific authors, most cited publications, developing topics, co-occurrence of keywords, conceptual structure map, and country collaboration network by using an advanced bibliometric package. As such, the researchers can collaborate with influential and productive authors and nations in particular by using the generated data. This intertwining provides practitioners access to the specifics of the current academic production and emerging themes articulated and characterized for the first time in this article. Once more, the findings of this study have practical implications for regulators and practitioners who have to manage the digital transformation and sustainability processes while trying to take advantage of the synergy existing between the two phenomena in the banking sector. Besides, the study has profound ramifications for policymakers and practice, particularly if we are to fulfill the 2030 sustainable development objective and significantly advance global goals by illuminating the positive contributions that dig-techs may make to achieve the SDGs in the banking sector. The pursuit of advancement in the field of digital transformation in the banking sector by academics, practitioners, and decision makers can be directed through these ramifications.

Limitations of the study

We acknowledge that every study contains flaws, and ours is no exception. The analysis carried out exposed some limitations: (1) the statistical tools for data analysis such as VOS viewer, Gephi, CitNetExplorer, and SciMat have been excluded which can portray better data visualizations; (2) specifically concentrated on English-language papers; (3) the intervals between the research's execution, publication, and citation may cause variations in the trends found in this study; (4) keywords may not generally adequately imitate the substance of the article, and some keywords may be excluded from consideration when creating the network because they do not satisfy the requirements for coexistence (5) the elimination of articles that were not included in the document type

"article" and "review"; (6) the study's sample inclusion was restricted to Social Sciences, Business Management, Accounting, Finance, and others.

Conclusion

The mounting significance of sustainable development and the transition to a lower-carbon economy will call for an explosion of innovative financial solutions that reinforce green initiatives and facilitate the change to a more sustainable and environmentally friendly financial system. Therefore, the overarching objective of the current study was to identify, assess, and consolidate the literature on digital technologies employed by banks and their influence on TBL sustainability using the Scopus and WoS databases. A total of 154 academic papers underwent analysis. The outcomes argue that the study concentrated on five thematic research clusters: (1) digitalization and sustainability (2) financial inclusion and sustainable development (3) information technology and customer relationship management (4) banks and innovation, and lastly (5) artificial intelligence. Overall, machine learning, blockchain technology, digital currency, digital economy, fintech, digitalization, innovation, artificial intelligence, financial technology, information technology, CBDC, digital banking, digital finance, industry 4.0, green banking, and profitability are observed to be the robust drivers for sustainable development in the banking sector evident from the conceptual map in Fig. 13. However, the delivery of financial services through artificial intelligence and digital currencies based on blockchain technology exemplifies a niche theme in Fig. 14. In essence, this bibliometric analysis provides a distinctive and original perspective on the contribution of banking dig-techs toward TBL sustainability by thoroughly and impartially evaluating previous research while also providing a clear path forward for future investigations. An amalgamation of future research directions has been derived from the SLR. These are listed below:

- (1) Future research work can expand upon this SLNA by gathering empirical data (from surveys and interviews) regarding how banks can go through the process of digital transformation toward sustainability. Specifically, these studies should determine technology priorities (for short, medium, and long-term terms) and create appropriate technology roadmaps to support digital transformation following the TBL performance of banks.
- (2) Currently, the conceptualization of explicitly integrating sustainability and dig-techs in the banking area is restricted to a few geographies (most studies are in China, Italy, India, Malaysia, and the UK only). Nevertheless, it can be expanded to other

emerging economies (such as Iran, France, Germany, and Iraq) identified through a collaboration network.

- (3) Thematic mapping makes it obvious that emerging themes like digital currency, chatbots, and green finance through dig-techs hold substantial importance for future research. Furthermore, we exhort researchers in this field to focus their upcoming studies on the factors that stimulate financial inclusion, the digital economy, and sustainable development in their forthcoming research.
- (4) The intricate big data-driven sustainable digital banking environment must be designed to be acceptable to all economies including emerging ones.
- (5) Further insights could also be obtained with more inductive research methods. For instance, "Which sustainable development goals can be achieved through banking digital transformation?" will make our analysis more transparent.
- (6) Subsequent research endeavors may concentrate on the strategies employed by leading digitalized banks in crafting their sustainability policies as well as the involvement of various stakeholders in this process such as regulatory bodies, managers, employees, and customers.
- (7) Examining the contributions made to the field by management scholars and industrial experts is imperative to expand theory and practice.

Abbreviations

SLR	Systematic literature review
WoS	Web of Science
RQs	Research questions
SLNA	Systematic literature network analysis
TBL	Triple bottom line
TC	Total citations
NP	Number of publications
MCP	Multiple country publications
SCP	Single country publications
SDGs	Sustainable development goals
CBDC	Central Bank Digital Currency
MCA	Multiple correspondence analysis
CRM	Customer relationship management
AI	Artificial intelligence

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Author contributions

'All author(s) read and approved the final manuscript.'

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Data availability

The data collected from the Scopus and Web of Science online databases were saved on Microsoft Excel and remained with authors but are available from the corresponding author upon request.

Declarations

Competing interests

"The author declares that they have no competing interests."

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