

A Bibliometric Review On Block Chain Technology Applications In Financial Services

Dr Nitin Tanted¹, Dr Sumit Zokarkar², Dr Deepesh Mahajan³, Dr Gagan Bhati⁴
^{1,2,3,4}Professor & Head of department, Prestige Institute of Management and Research, PG Campus,

Indore 2, Education & Health Sector Scheme 54, Indore,

¹India, nitin_tanted@pimrindore.ac.in

²India, sumit_zokarkar@pimrindore.ac.in

³India, deepesh_mahajan@pimrindore.ac.in

⁴India, gagan_bhati@pimrindore.ac.in

Abstract

Blockchain technology has emerged as a disruptive innovation with significant implications for the financial services industry. This bibliometric review aims to analyze the academic literature on blockchain applications in financial services, identifying key trends, influential authors, and emerging research areas. This research contributes by offering a comprehensive overview of the blockchain's journey in financial services. Following the PRISMA approach, the authors meticulously curated relevant articles from the Dimension database. Bibliographic data were then meticulously assembled and analyzed using VOSviewer 1.6.20 and Bibliometrix version 4.3.0 employed to construct various network visualization maps, including co-authorship, citation, co-citation, bibliographic coupling, and term co-occurrence. The resulting network maps provided a comprehensive overview of the scholarly landscape, highlighting influential works, collaborative networks, and thematic clusters. By conducting a systematic review and bibliometric analysis, we aim to identify research gaps, influential authors, key themes and trends, thus providing a holistic understanding of blockchain's role in the financial sector. Paper also discusses the future scope in blockchain applications in fintech applications.

Keyword: Blockchain, Financial Services, Fintech, Bibliometric, Review Paper, VOSViewer

INTRODUCTION

Blockchain technology, often considered one of the most groundbreaking innovations of the 21st century, initially served as the backbone of Bitcoin and has since evolved into a versatile platform with applications extending beyond cryptocurrencies (Lee, Shih, & Zheng, 2023; Mukhtarov, 2023). At its core, blockchain is a decentralized and distributed ledger that records transactions across multiple computers, making it nearly impossible to alter past records without modifying all subsequent blocks and gaining network consensus. This inherent immutability, reinforced by cryptographic security, makes blockchain a highly effective tool for ensuring data integrity and transparency (Idrees, Nowostawski, Jameel, & Mourya, 2021). Blockchain technology plays a crucial role in the financial services sector. Traditional financial systems often face inefficiencies such as high transaction costs, delays, and susceptibility to fraud and errors. Given the industry's intricate network of transactions, agreements, and regulatory requirements, blockchain offers significant advantages (Javaid, Haleem, Singh, Suman, & Khan, 2022). By providing a more secure, transparent, and efficient alternative, blockchain can address these challenges. For instance, it can significantly reduce transaction costs and processing times by eliminating intermediaries. Furthermore, its decentralized nature minimizes the risk of single points of failure, enhancing the security of financial transactions (Tsang, Wu, Lam, Choy, & Ho, 2021).

The importance of blockchain in the financial services sector encompasses various uses, such as international payments, remittances, securities trading, and compliance with regulations. In the realm of international payments, blockchain can accelerate and simplify transactions that typically involve numerous intermediaries and may take several days to finalize. By facilitating transaction settlements within minutes, blockchain-based solutions provide significant advantages for both individuals and businesses. In the area of securities trading, blockchain improves efficiency by optimizing processes, reducing mistakes, and offering real-time transparency. Additionally, its unchangeable ledger helps financial institutions comply with regulatory standards more efficiently by maintaining a clear and permanent record of transactions (Javaid et al., 2022).

Blockchain technology has emerged as a disruptive innovation with significant implications for the financial services industry. By offering decentralized, secure, and transparent transaction mechanisms, blockchain has the potential to revolutionize various financial activities, including payments, trading, and compliance. This bibliometric review aims to analyze the academic literature on blockchain applications in financial services, identifying key trends, influential authors, and emerging research areas. This research contributes by offering a comprehensive overview of the blockchain's journey in financial services. By conducting a systematic review and bibliometric analysis, we aim to identify research gaps, influential authors, key themes and trends, thus providing a holistic understanding of blockchain's role in the financial sector.

The primary objectives of this study are as follows:

R1: What is the trend in the existing literature on blockchain technology and its application on financial services?

R2: To determine influential author in this domain

R3: To determine the geographic and citation wise distribution of publications in this domain

R4: To identify the list of prolific journals covering the publications in this domain

Conceptual framework: Blockchain

Definition and Core Concepts of Blockchain

Blockchain technology is a decentralized digital ledger system that securely records and verifies transactions across multiple computers. This system ensures that once data is recorded, it cannot be altered retroactively without modifying all subsequent blocks and gaining consensus from the network. The decentralized nature of blockchain eliminates the need for a central authority, instead relying on a distributed network of participants who collectively maintain and verify the ledger's integrity (Tanwar, 2022). At its core, the blockchain technology operates based on three fundamental principles: decentralization, transparency, and immutability. Decentralization ensures that no single entity has control over the entire network, reducing the risks associated with centralized points of failure. Transparency is achieved as all participants in the network have access to the complete transaction history stored on the blockchain, enabling independent verification of transactions. Immutability guarantees that once information is recorded on the blockchain, it is nearly impossible to alter or tamper with it. This feature provides a secure, reliable, and tamper-proof method of recording transactions, making blockchain an essential tool in various sectors, including finance, healthcare, and supply chain management (Zarrin, Wen Phang, Babu Saheer, & Zarrin, 2021).

Key Components of Blockchain: Blocks, Chains, Nodes, and Consensus Mechanisms

Blockchain technology consists of several key components that work together to ensure its functionality and security. These components include blocks, chains, nodes, and consensus mechanisms.

Each block in the blockchain contains a list of transactions, a timestamp, and a reference to the previous block, known as the hash. The hash serves as a unique cryptographic representation of the block's data, linking it to its predecessor. This linkage forms a continuous chain of blocks, hence the name "blockchain." The chaining of blocks ensures that data is stored in a chronological and immutable manner, thereby maintaining the integrity of the information recorded (Miyachi & Mackey, 2021; Zhao, 2022). Nodes are the individual computers or devices that participate in the blockchain network. Each node maintains a complete copy of the blockchain and adheres to the protocol required to validate and propagate transactions. Nodes play a crucial role in maintaining the decentralized nature of blockchain networks by independently verifying transaction authenticity and ensuring the integrity of the entire system (Zhong et al., 2021). Consensus mechanisms are protocols that blockchain nodes use to agree on the validity of transactions and the overall state of the blockchain. The two most common consensus mechanisms are Proof of Work (PoW) and Proof of Stake (PoS). PoW requires nodes to solve complex mathematical problems to validate transactions and add new blocks to the blockchain. This process, known as mining, is resource-intensive but provides high security through computational effort. PoS, on the other hand, selects validators based on the number of tokens they hold and are willing to "stake" as collateral. PoS is more energy-efficient than PoW and encourages validators to act honestly, as their stake is at risk if they attempt to validate fraudulent transactions (Saad, Qin, Ren, Nyang, & Mohaisen, 2021).

Types of Blockchain: Public, Private, and Consortium Blockchains

Blockchain networks can be classified into three main types: public, private, and consortium blockchains. Each type has distinct levels of access control, governance, and application use cases.

Public blockchains are open and decentralized, allowing anyone to participate as a node, validate transactions, and contribute to the consensus process. Examples of public blockchains include Bitcoin and Ethereum. These networks are highly secure due to their large number of participants and the transparency of their operations. However, public blockchains can be slower and less efficient due to their open nature and the computational resources required for consensus (Kshetri, 2021).

Private blockchain, also known as permissioned blockchains, restrict access to a predefined group of participants. These blockchain are commonly used by organizations that require greater control over the network and its data. Private blockchains offer increased efficiency and faster transaction processing, as they involve fewer nodes and do not require energy-intensive consensus mechanisms like PoW. However, they sacrifice some security and decentralization benefits in favor of control and efficiency (Zeba, Suman, & Tyagi, 2023). Consortium blockchains represent a hybrid approach where multiple organizations jointly manage and operate the blockchain. Access to the network is limited to the consortium members, who collaboratively validate transactions and maintain the blockchain. This type of blockchain offers the efficiency and control of private blockchains while incorporating aspects of the decentralized trust model seen in public blockchains. Consortium blockchains are particularly useful in industries where multiple entities must collaborate and share information securely, such as supply chain management, finance, and healthcare (Shrimali & Patel, 2022; Zeba et al., 2023).

Smart Contracts and Their Role in Financial Services

Smart contracts are self-executing agreements with the terms of the contract directly written into code. These contracts automatically enforce and execute terms when predefined conditions are met, eliminating the need for intermediaries. Smart contracts are deployed on blockchain platforms, where they inherit the properties of transparency, security, and immutability. In the financial sector, smart contracts have the potential to revolutionize various processes by automating transactions and reducing reliance on intermediaries. For instance, in securities trading, smart contracts can automate trade settlements, ensuring that transactions are executed only when all conditions are met. This reduces the risk of human error and fraud, speeds up settlement processes, and lowers operational costs by eliminating the need for third-party intermediaries (Tseng & Shang, 2021). Similarly, smart contracts can facilitate automated loan disbursements, interest payments, and collateral releases in the context of loans and mortgages (Garg, 2023). By streamlining the loan approval process and enforcing contractual terms without manual intervention, smart contracts enhance transparency and ensure that all parties adhere to predefined agreements. Insurance companies can also benefit from smart contracts by automating claims processing. This reduces the time and administrative costs associated with verifying and approving claims. Once predefined conditions, such as accident verification or policy requirements, are met, smart contracts can trigger automatic payouts, enhancing efficiency and customer satisfaction. Moreover, smart contracts contribute to regulatory compliance by providing transparent and auditable transaction records. Financial institutions can use smart contracts to ensure that all activities align with regulatory requirements, thereby simplifying auditing processes and minimizing the risk of non-compliance (Drummer & Neumann, 2020; Udeh, Amajuoyi, Adeusi, & Scott, 2024a, 2024b). Blockchain technology has emerged as a transformative innovation that enhances security, transparency, and efficiency in various industries. Its decentralized and immutable nature makes it particularly useful for applications that require secure and tamper-proof record-keeping. The key components of blockchain, including blocks, chains, nodes, and consensus mechanisms, work together to ensure the integrity and security of transactions. The classification of blockchain networks into public, private, and consortium types highlights the diverse applications of the technology, catering to different levels of accessibility, control, and governance requirements. Additionally, the integration of smart contracts into financial services demonstrates the potential of blockchain to revolutionize processes by automating transactions, reducing intermediary costs, and ensuring regulatory compliance. As blockchain technology continues to evolve, its adoption across industries is expected to grow, leading to increased efficiency, security, and trust in digital transactions. While challenges such as scalability,

regulatory frameworks, and energy consumption remain, ongoing research and development efforts aim to address these issues and unlock the full potential of blockchain technology in the global economy.

Process and Research Methodology:

The authors have implemented four crucial and progressive steps, including searching, assessing, amalgamating, and examining, to guarantee that their systematic review and bibliometric investigation are firmly grounded in a transparent and unequivocal examination of pertinent previously published research (Banerjee et al., 2022; Zhao et al., 2023). The procedure for seeking pertinent literature has encompassed establishing and applying various filters and criteria across multiple phases (Saif et al., 2022).

Literature Search

An exhaustive search methodology encompassing several stages utilized to locate pertinent materials for this research. The search was limited to a well-regarded and extensively recognized database, specifically Scopus, chosen for its advanced search and analytical capabilities. Dimension selected due to its extensive repository of peer-reviewed publications spanning nearly all fields of research.

In the context of database searches, we considered literature published from 2015 to 2024. This timeframe chosen because all the databases we selected had records available for review starting from 2015 onwards. Table 1 illustrates the methods and procedures utilized for carrying out database searches in this study.

Search Focus	Search field	Research Databases	Period	Search Keywords	Sort by	Total number of papers
Blockchain Technology Application in Financial Services	Title, Abstract, Keywords	Dimension	2015-2024	("blockchain" OR "Distributed Ledger Technology" OR "Smart Contracts") AND ("Financial" OR "Banking" OR "Payment")	Relevance	13475

Procedure of Assessing Literature

To evaluate the pertinent literature for this study, the authors employed the PRISMA diagram, which stands for Preferred Reporting Items for Systematic Reviews and Meta-Analysis (Salameh et al., 2020). The authors adhered to the recently revised PRISMA 2020 guidelines to categorize the applicable documents suitable for reporting.

Locating Applicable Papers in the Research Databases

Figure-1 below depicts the strategies employed to monitor and manage the optimal number of publications for subsequent in- depth reporting, resulting in a total of 206 identified documents.

Synthesis of the Literature

A total 479 pertinent publications chosen to report their bibliographic details, following a systematic identification process. Recognizing the significance of comprehensive bibliographic information in analysing research trends (Hsiao and Chen, 2020), the bibliographic data from the selected publications exported in CSV and RIS file formats to facilitate further exploration.

Process for Analysis and Reporting

Data extracted from publications spanning the period from 2015 to 2023 utilized to produce several visual representations for evaluating and summarizing the findings and contemporary research trends. Bibliometric tools such as VOSviewer 1.6.20 and Bibliometrix version 4.3.0 employed to analyze co-authorship, co-citation, and keyword co-occurrence. Metrics such as citation count, h-index, and

publication frequency used to assess influence and impact. The figure-1 below represents PRIZMA model.

Figure 1PRIZMA

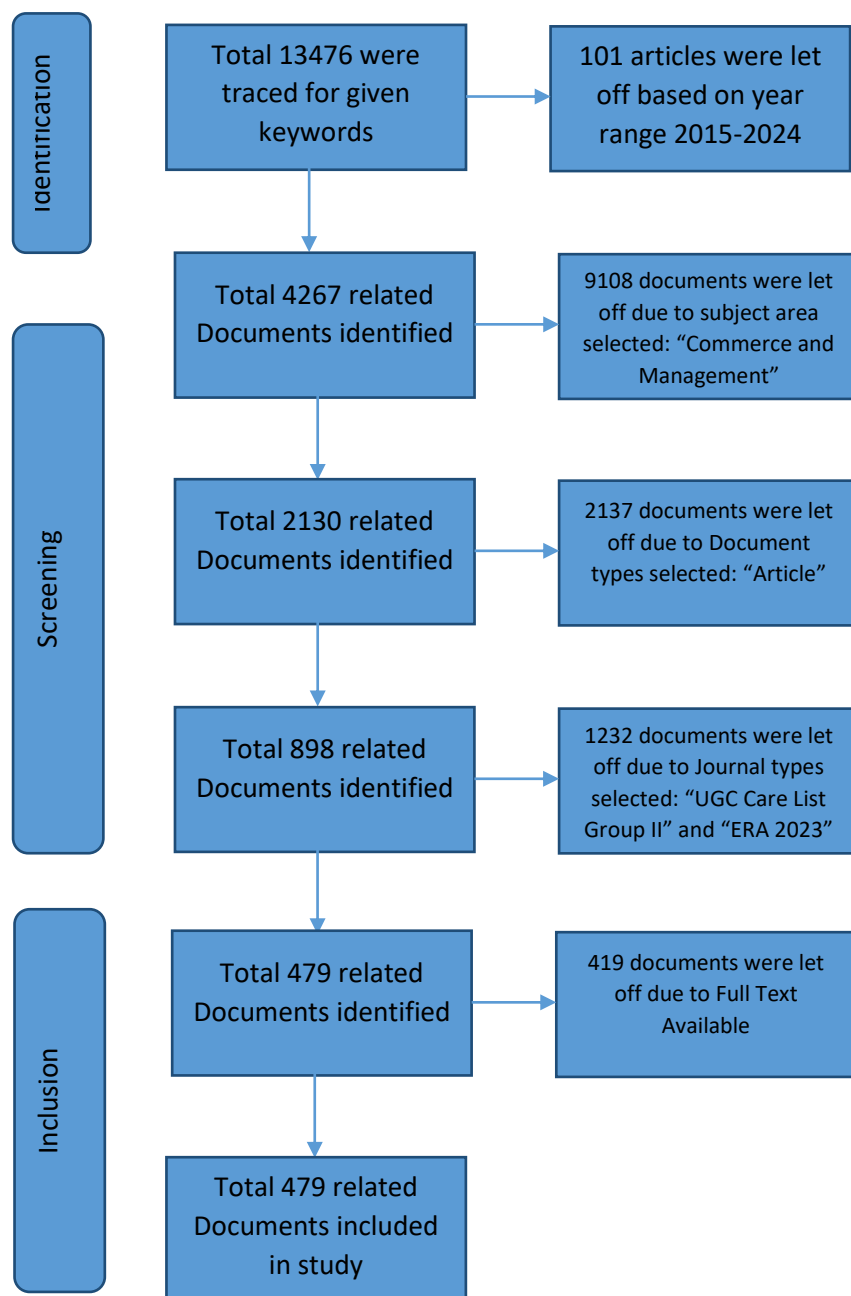


Figure-2 below represents the quantity of documents generated between 2015 and 2024. In 2015 and 2016, only one document published. The following year, 2017, there was a notable increase with 12 publications. Subsequently, the production of documents increased significantly, reflecting heightened interest from a broader range of researchers. In 2020, the number of publications reached to more than double to 61. Although there were some fluctuation in document publication after 2020, 2022 maintained the same figure of 65 documents in this field.

Figure 2Annual Scientific Production

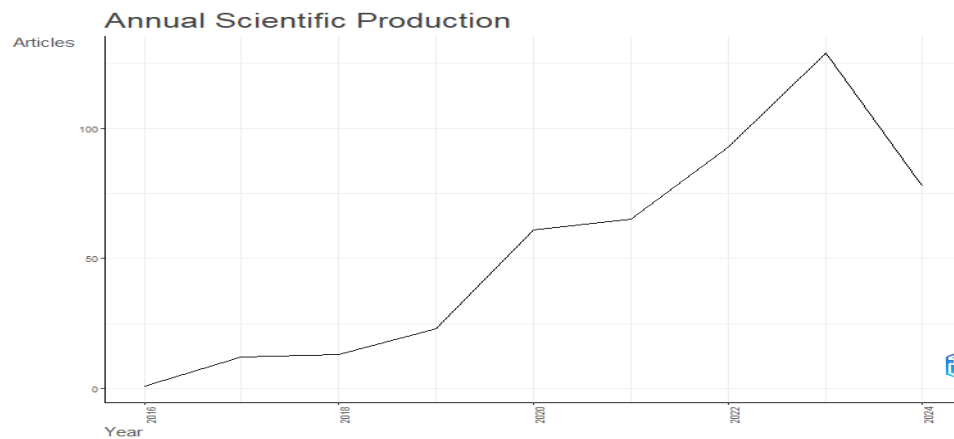


Table 1 Year wise Article

Year	Articles
2016	1
2017	12
2018	13
2019	23
2020	61
2021	65
2022	93
2023	129
2024	78

Consequently, post-2020, there is a discernible uptrend in attention to this field, evident in the escalating number of documents. The number of publications related to blockchain and financial services has significantly increased over the past decade. This is an indication of blockchain's growing importance in the financial industry.

Table 2 Most Productive/Prolific Journals

Sources	Articles
SUSTAINABILITY	37
JOURNAL OF RISK AND FINANCIAL MANAGEMENT	24
FINANCIAL INNOVATION	19
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	9
JOURNAL OF OPEN INNOVATION: TECHNOLOGY, MARKET, AND COMPLEXITY	8
JOURNAL OF THEORETICAL AND APPLIED ELECTRONIC COMMERCE RESEARCH	8
PLOS ONE	8
APPLIED SCIENCES	7
ELECTRONIC MARKETS	7
IOP CONFERENCE SERIES MATERIALS SCIENCE AND ENGINEERING	7
MANAGEMENT SCIENCE	7
ANNALS OF OPERATIONS RESEARCH	6

Sources	Articles
RISKS	6
UNCERTAIN SUPPLY CHAIN MANAGEMENT	5
COMPUTATIONAL INTELLIGENCE AND NEUROSCIENCE	4
INTERNATIONAL JOURNAL OF BUSINESS AND MANAGEMENT	4
INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT	4
INTERNATIONAL REVIEW OF FINANCIAL ANALYSIS	4

The Table-2 above,demonstrate that academic publications in this domain is notably concentrated in high-output journals such as Sustainability (37 articles), Journal of Risk and Financial Management (24 articles), and Financial Innovation (19 articles). These publications explore how blockchain is transforming finance through decentralized finance (DeFi), asset tokenization, smart contracts, and real-time auditing. Financial Innovation (19) particularly emphasizes blockchain's ability to improve transaction speed, reduce costs, and enable new financial instruments. In parallel, Journal of Risk and Financial Management (24) focuses on the technology's role in enhancing financial risk management, securing transactions, and enabling compliance mechanisms within fintech.

Technological Forecasting and Social Change (9) and Electronic Markets (7) contribute foresight-driven perspectives, forecasting how blockchain may disrupt financial intermediaries and reshape global financial infrastructures. Sustainability (37), while traditionally ESG-focused, integrates blockchain use cases in areas like carbon credit systems and sustainable financial practices, underlining the tech's role in transparent, traceable, and ethical finance. This cluster of journals reflects a growing consensus that blockchain is evolving from a disruptive concept to a core driver of transformation in the financial services landscape.

These all journals published by well-respected publishers and considered to be among the most relevant journals for research on blockchain and financial services. They publish high-quality research that is widely read by academics and practitioners.

Table 3 h-Index of Journals

Source	h_index
SUSTAINABILITY	16
FINANCIAL INNOVATION	8
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	8
JOURNAL OF RISK AND FINANCIAL MANAGEMENT	7
ANNALS OF OPERATIONS RESEARCH	5
APPLIED SCIENCES	5
ELECTRONIC MARKETS	5
IOP CONFERENCE SERIES MATERIALS SCIENCE AND ENGINEERING	5
JOURNAL OF OPEN INNOVATION: TECHNOLOGY, MARKET, AND COMPLEXITY	5
JOURNAL OF THEORETICAL AND APPLIED ELECTRONIC COMMERCE RESEARCH	5
MANAGEMENT SCIENCE	5

It is important to note that the number of articles published in a journal is not the only measure of its impact. Other factors, such as the quality of the research it publishes and the reach of its readership, are also important. Above Table-3 shows the h-index of these journals.

Figure 3 Citation strength by Sources

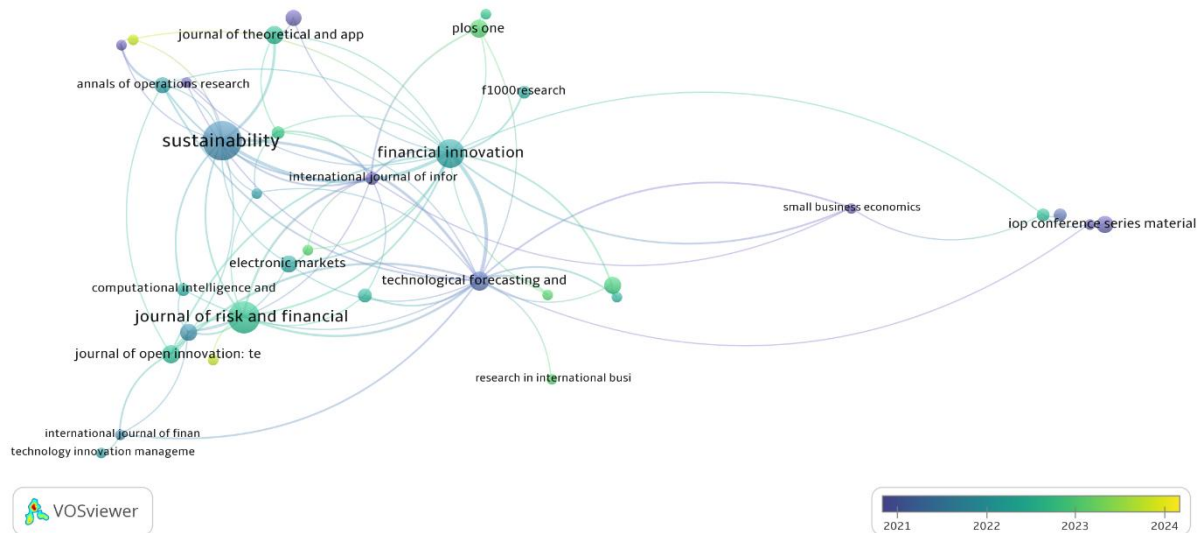


Figure 2 above shows that sustainability and financial innovation are two prominent journals publishing quality content in the area of blockchain.

Table 4 presents an overview of academic publications by country on blockchain and financial services between 2015 and 2024. China leads the global research output in this area, highlighting its strategic commitment to integrating blockchain technology into financial systems. The United States follows with 65 publications, indicating a robust engagement with blockchain innovation in fintech and related sectors. Italy also shows strong academic involvement, contributing 56 papers. Other notable contributors include Germany (54), Spain (41), the United Kingdom (39), and India (37), reflecting a diverse international interest in this domain.

On the other end of the spectrum, countries like Australia, Switzerland, and France recorded relatively lower research outputs during the same period. This distribution of academic activity underscores the dominant role of China and the USA in shaping the research landscape on blockchain applications in financial services. Their leadership suggests not only greater institutional investment in blockchain R&D but also a growing influence on global fintech discourse and policy development.

Table 4 Top Contributing Countries

Country	Publication No.s
CHINA	154
USA	65
ITALY	56
GERMANY	54
SPAIN	41
UK	39
INDIA	37
AUSTRALIA	20
SWITZERLAND	18
FRANCE	17

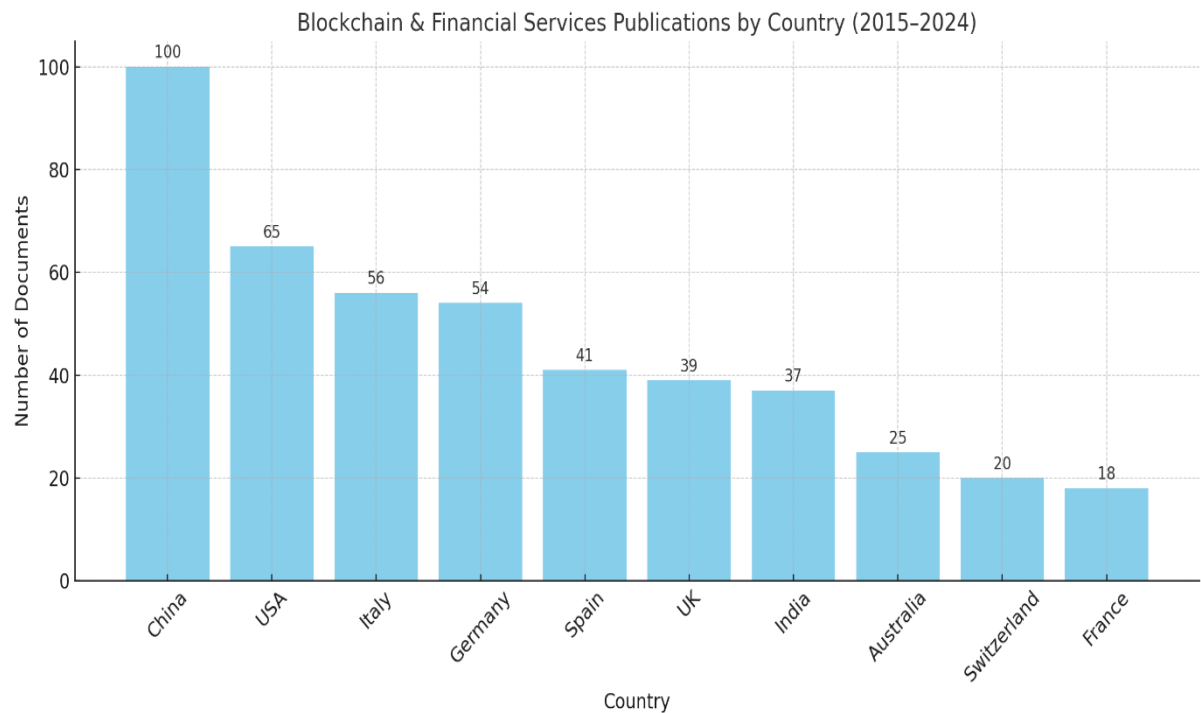


Figure 4 No. of Articles by Author

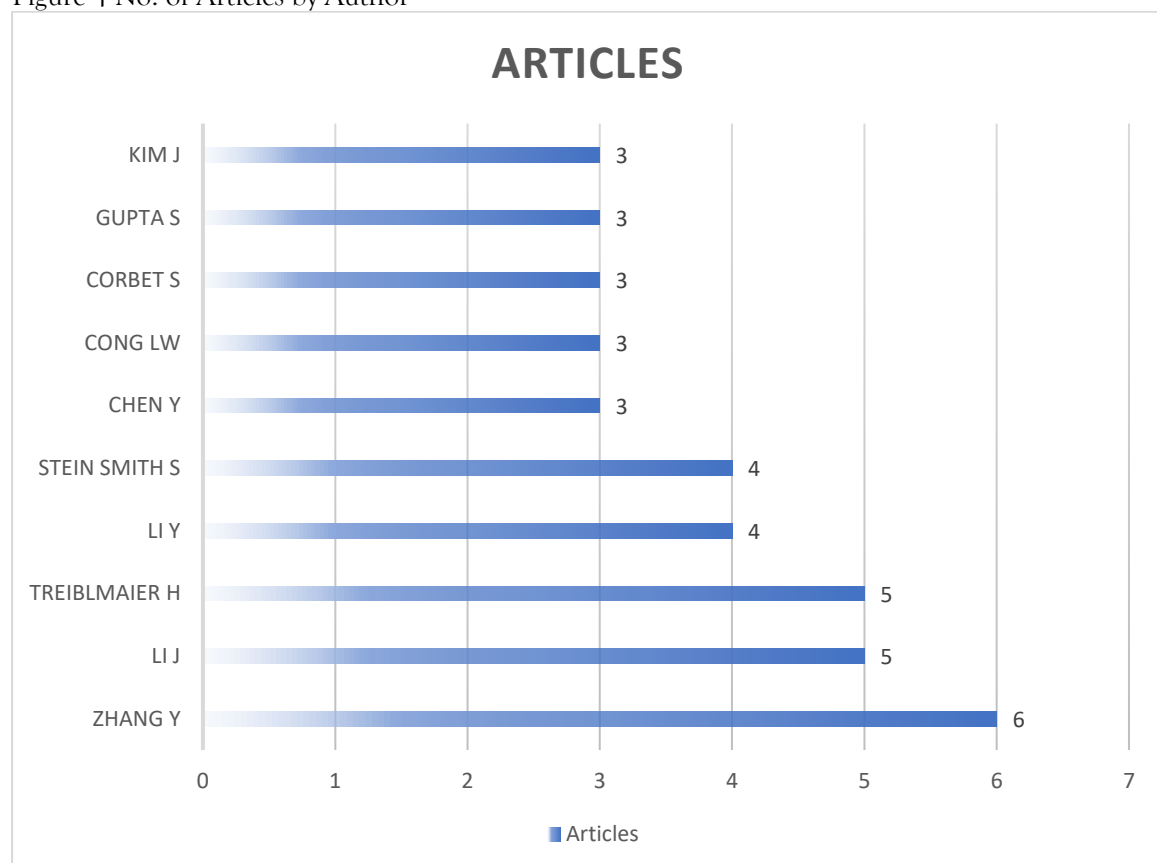


Figure 2 contrasts the documents presented by various authors spanning the years 2015 to 2024. Throughout this timeframe, Zhang stands out by reporting the highest number of documents, totaling six, followed by Li J and Treiblmaier H with 5 documents each. while all other authors made equal contributions, each presenting four and three documents.

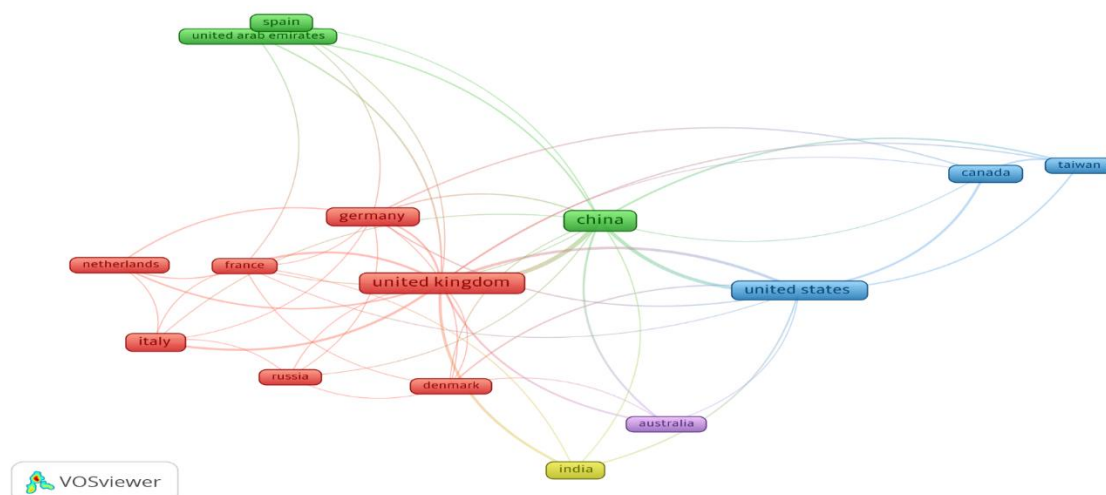


Figure 5 Bibliographic coupling of countries

Figure 5 illustrates the international co-authorship network based on the total link strength between countries in the field of blockchain and financial services research. In this visualization, each node represents a country, while the connecting lines (or edges) reflect the intensity of collaborative efforts—thicker lines denote stronger research partnerships. This network structure helps uncover the global dynamics of scholarly collaboration and highlights key players in the field.

A closer analysis of the graph reveals that the United Kingdom (UK) holds the most influential position within the co-authorship network. Its central location and dense connections signify strong collaborative ties with several countries, notably Spain, Germany, Italy, Switzerland, Hong Kong, China, and India. China emerges as the second most interconnected country, forming significant research partnerships with Canada, Taiwan, the UAE, India, the UK, Spain, and the USA. In stark contrast, Russia demonstrates minimal engagement within this academic network, evidenced by its total link strength of just 5. Among all collaborations, the UK-China link stands out as the most prominent, showcasing a particularly high level of joint research output and cross-border academic synergy.

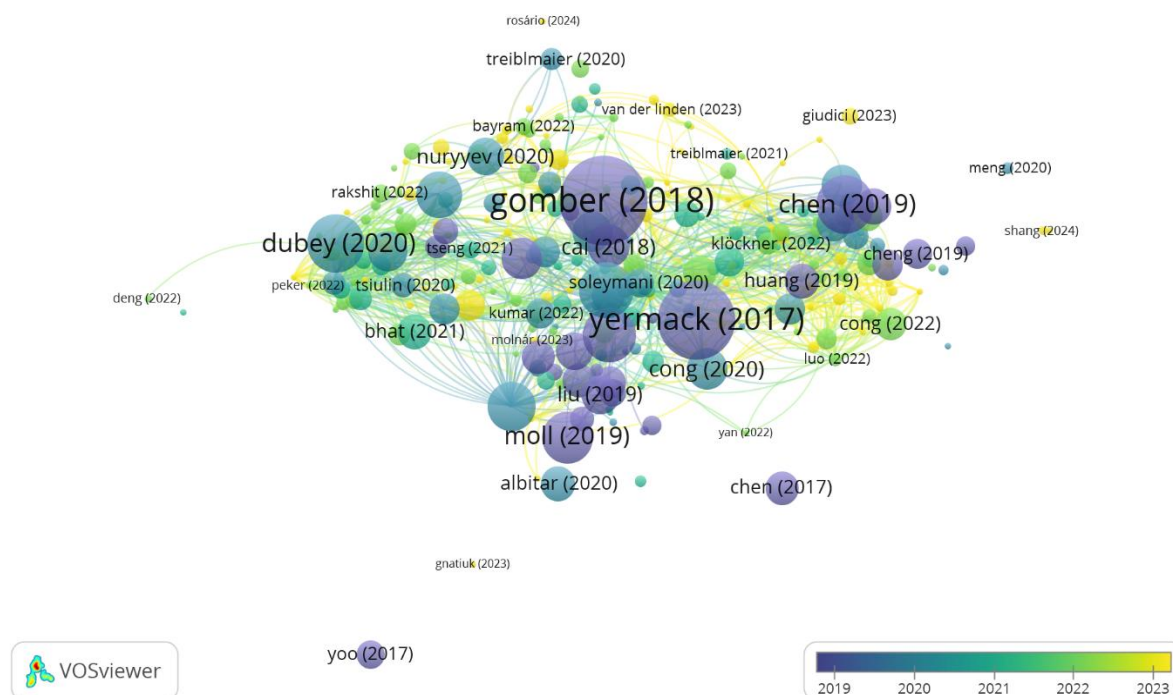


Figure 6 Bibliographic coupling of documents

Figure 6 exhibits bibliographic coupling among authors. Bibliographic coupling appears when different authors cite same document. The investigation shows that bibliographic coupling is occurring with a high degree with 936 citations (GOMBER P, (2018)) followed by (MORKUNAS VJ, (2017)) with 469 citations.

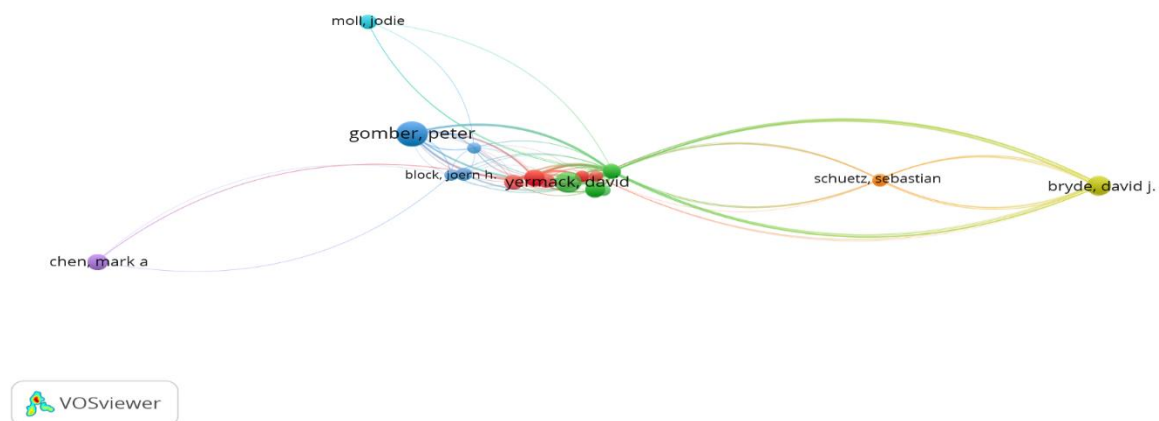


Figure 7 Bibliographic coupling of authors

To find term co-occurrence, a figure created by looking through the abstracts and titles of a few chosen publications. Terms with same colours often suggest that they used together, and each bubble's size reflects how frequently it is used. Analysis reveals that out of total selected terms (31 numbers as per vovs viewer), (16) terms have been used significantly in the cited research studies and (15) terms have been used insignificantly.

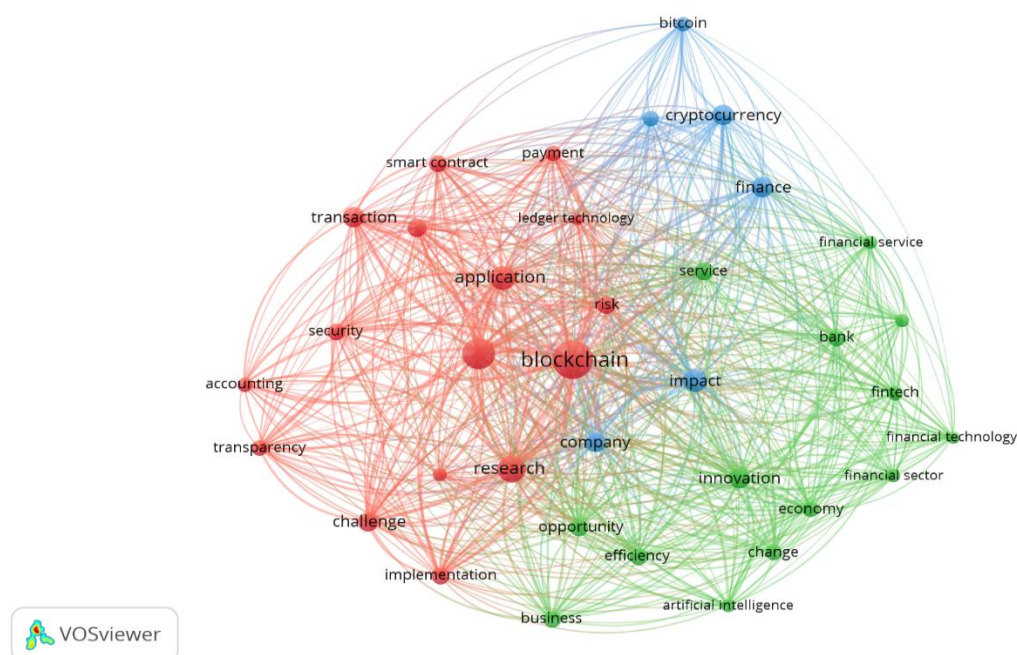


Figure 8 Text databased Term Co-occurrence Map

Table 5 Proposed themes

Term from bibliographic visualization	1st level filtration and association	Themes
Bitcoin, cryptocurrency, smart contract, payment, finance, transaction, ledger technology, application, risk, service, financial service, security, blockchain, impact, bank, accounting, fintech, transparency, research, company, financial technology, innovation, financial sector, challenge, opportunity, implementation, efficiency, change, business, artificial intelligence	Bitcoin, cryptocurrency, smart contract, ledger technology, blockchain	CryptoLedger Technology
	Finance, Payment, Transaction, BankAccounting, Financial ServiceFintech, Financial Technology, RiskSecurity, Transparency	Secure Financial Technology
	Research, Innovation, Artificial, Intelligence, Company, Application Implementation, Change, Efficiency Business, Impact, Challenge, Opportunity	Innovation and AI in Finance

DISCUSSION ON THEMES

The basic technology of Blockchain, which are cryptographic hashing, decentralization, and immutability, are the real foundation on which its disruptive nature in the financial market is built. These technologies manage the main problems by making transaction security better, and by increasing efficiency and trust and transparency. Cryptographic hashing is the process of guaranteeing the uniqueness of every single transaction, thus, each block linked with the other one in a chain that is tamper-resistant. This immutability is a capability that ensures an audit trail that is untampered with and thus, the fraud and error problems are mitigated through this technology. The success of decentralized systems enhances security by removing single vulnerabilities that are characteristic of centralized systems, as highlighted by Drummer and Neumann (2020). Banking systems that dominate the world market, particularly cross-border transfer finance programs, have issues like delays and high expenses. Blockchain systems, for example, Ripple, use the decentralized approach to the real-time processing of transactions which, as a consequence, lowers the costs and errors. A paper published by Agarwal et al. (2023) demonstrates blockchain's contribution to the improvement of the securities trading sector through data consistency and the automatic settlement of transactions. Immutability and decentralization establish trust between the members. For this, for example, blockchain-based identity management systems will be the tool for safe and tamper-proof digital identity verifications, which are of major value in banking and anti-fraud processes, among others. The work of Udeh et al. (2024) suggests blockchain's potential in digital identity systems and smart contracts which may secure digital identity. The most significant blockchain systems have gained immense prominence due to their technological advantages; nonetheless, these attributes are in return threatened by the factors of scalability and the 51% attacks. Eminent research shows that with an ever-increasing distribution of the network, together with the creation of better scripting techniques for smart contracts, the aforementioned problems can be avoided (Zitar et al., 2021). The underlying technologies are the ones that make blockchain such a powerful tool in the financial services sector. It's a tool that enables the organizations to secure their operations, be more efficient, and conduct their business transparently. Their future development and thus, solving the existing problems will serve to make way for the new financial applications that have been envisaged. Blockchain technology revolutionizes financial services through applications such as real-time payments, secure settlements, and transparent financial operations. It comes with risks that call for robust mitigants. Blockchain technology allows for instantaneous and cost-effective cross-border payments without intermediaries. Ripple's blockchain-based solutions, for example, simplify global remittance processes (Agarwal et al., 2023). Distributed ledgers simplify securities trading since they

automatically settle, with the addition of integrity in data. The Australian Securities Exchange uses blockchain as the only source of truth, reducing discrepancies and fraud. Secure digital identities that are built on blockchain decrease risks of identity theft and enhance customer onboarding, which offers transparent yet private systems for financial verification (Udeh et al., 2024). With increasing transactions, blockchain networks can experience latency, especially in public chains, and thus need techniques like layer-two scaling and enhanced consensus mechanisms to help eliminate or minimize latency effects (Zitar et al., 2021). Smaller blockchain networks are prone to attacks such as the 51% attack, allowing one entity to control the majority power in a network to manipulate data. The risk is lower with effective decentralization (Onwubiko, 2020). Poorly coded smart contracts can cause considerable losses or exploitation. Therefore, rigorous audits and the best practices in coding are required to ensure safe deployment. According to blockchain's financial services periphery, it could possibly change the efficiency, transparency, and accessibility but continue by mitigating their associated risks such as scalability and security. Ongoing research into mitigation strategies and technological evolution will help integrate blockchain further into mainstream financial systems. Blockchain within Financial Services has tended to focus on the application of blockchain in financial services and its transformative potential and challenges. Studies have discussed how blockchain is supposed to make transactions more transparent, safe, and efficient while highlighting critical factors for successful deployment. Focus Areas: Research highlights blockchain applications in payments, asset management, identity verification, and fraud prevention. For example, cryptographic hashing and decentralized systems have been shown to improve the integrity and trust of transactions (Zitar et al., 2021). Innovation Drivers: Adoption comes from the fact blockchain promises to eliminate intermediaries, automate processes through smart contracts, and provide immutable records for auditing (Agarwal et al., 2023). Technical Barriers: Scalability and energy consumption in consensus mechanisms are areas of concerns, most particularly in public blockchains. Emerging solutions like proof-of-stake look forward to mitigating these issues (Udeh et al., 2024). Regulatory Uncertainty: Different regulations worldwide act as a barrier to mainstreaming. Harmonization of various legal norms will be important for building confidence among stakeholders. Research literature suggests taking hybrid blockchain networks for scalability and privacy purposes, with a focus on the development of robust smart contracts to reduce vulnerability. Academia, industries, and governments need to collaborate to overcome the challenges of implementation.

Implications of this Study

This research highlights the significant influence that blockchain technology is expected to have on the future of financial services. It indicates that blockchain is leading to a major transformation towards decentralization, altering the framework of conventional financial systems. By incorporating elements such as smart contracts, distributed ledger technology, and cryptocurrencies, blockchain is facilitating a shift towards more transparent, secure, and inclusive systems. The rise of decentralized finance (DeFi) further emphasizes this transition by encouraging financial inclusivity and challenging established norms within the international financial sector. However, the research also points out several important challenges that must be tackled. These challenges include scalability concerns, regulatory ambiguities, and the need for different systems to work together seamlessly. Overcoming these challenges will necessitate substantial effort and cooperation from industry players, policymakers, and scholars collectively. Ultimately, the study reinforces the idea that blockchain transcends mere technological advancement; it signifies a fundamental reconfiguration of financial systems. This change requires adaptation, strategic vision, and joint effort from all parties engaged in the financial services industry.

Scope and Future Researches

The systematic review and bibliometric analysis conducted in this study regarding blockchain and the future of financial services lays the groundwork for a range of promising research avenues within these domains. One of the primary focuses for upcoming research should be on creating scalable solutions to tackle the existing obstacles that hinder the broad adoption of blockchain in financial systems. It will be essential to address challenges such as transaction speed, network congestion, and energy consumption to unlock blockchain's complete potential in high-volume financial transactions. Another important area to investigate involves the ethical issues surrounding decentralized finance (DeFi), which include

concerns about privacy, security, and possible disparities. Furthermore, longitudinal studies that track the development of blockchain technologies and their tangible effects on financial systems will provide essential insights into the growth and sustainability of these transformative innovations. Together, these research pathways hold the promise of deepening our understanding of blockchain's impact on the future of financial services and offering practical recommendations for its implementation in the years ahead.

CONCLUSION

The decentralized and transparent blockchain technology is technical data liberation and can destroy traditional courses of finance. With the technology of distributed ledgers and smart contracts, blockchain has its way toward overlooking various weaknesses existing in conventional financial systems. It is important that decision-makers in the financial services sector equip themselves with certain competencies in blockchain technology. This to develop the analytical capabilities, required for decision-making, to instigate change in the technology, financial behaviours, their impacts, and how society interacts with them. Decision-makers in the financial services sector need to appreciate and understand the relevant mechanisms of blockchain technology's functions. As a first step toward grasping and understanding the unique features of blockchain, it is crucial to argue in favour of a blockchain-based financial transfer: transactions, settlement, and clearing, in addition to regulations for risk, taxation, and anti-money laundering. Blockchain's transparency helps build trust and accountability by serving a large area of fintech. Each transaction is recorded on the blockchain, creating an immutable and verifiable record. This increases transparency and reduces opportunities for fraud, corruption, and operational inefficiency. Furthermore, smart contracts can automate compliance checks, thereby ensuring that transactions are compliant with existing regulatory regimes.

Thus, blockchain technologies have the potential to widen financial inclusion by providing, through extensive unexplored research avenues, access to financial services for excluded populations by linking such individuals to the broader economy with less transaction costs, in regions with low access to such traditional banking services. While enormous advantages are provided to blockchain, there are hurdles in hedging the outlook for the industry that need to be addressed before their potential may be realized. Scalability, interoperability, and regulatory uncertainty are among several wide-reaching issues that require resolution. All these challenges present opportunities for innovation and the development of new solutions. Lastly, connection among an extensive growing number of financial institutions, policymakers, and industry stakeholders is required for effective regulation-building; to spawn innovation and to acquire widespread knowledge and understanding of this technology, decision-makers will need proper knowledge so they can channel its development in such a direction to further optimize financial development.

REFERENCES

1. Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959-975.
2. Banerjee, S., Khatri, N., Kaur, A., & Elhence, A. (2022). Bibliometric analysis of top 100 systematic reviews and meta-analyses in orthopaedic literature. *Indian Journal of Orthopaedics*, 56(5), 762-770.
3. Zhao, L., Yang, M. M., Wang, Z., & Michelson, G. (2023). Trends in the dynamic evolution of corporate social responsibility and leadership: A literature review and bibliometric analysis. *Journal of Business Ethics*, 182(1), 135-157.
4. Saif, A. N. M., Islam, K. A., Haque, A., Akhter, H., Rahman, S. M., Jafrin, N., ... & Mostafa, R. (2022). Blockchain Implementation Challenges in Developing Countries: An evidence-based systematic review and bibliometric analysis. *Technology Innovation Management Review*, 12(1/2), 1-17.
5. Salameh, J. P., Bossuyt, P. M., McGrath, T. A., Thombs, B. D., Hyde, C. J., Macaskill, P., ... & McInnes, M. D. (2020). Preferred reporting items for systematic review and meta-analysis of diagnostic test accuracy studies (PRISMA-DTA): explanation, elaboration, and checklist. *bmj*, 370.
6. Hsiao, T. M., & Chen, K. H. (2020). The dynamics of research subfields for library and information science: an investigation based on word bibliographic coupling. *Scientometrics*, 125(1), 717-737.
7. Drummer, D., & Neumann, D. (2020). Is code law? Current legal and technical adoption issues and remedies for blockchain-enabled smart contracts. *Journal of information technology*, 35(4), 337-360.
8. Agarwal, N., Wongthongtham, P., Khairwal, N., & Coutinho, K. (2023). Blockchain application to financial market clearing and settlement systems. *Journal of Risk and Financial Management*, 16(10), 452.

9. Udeh, E. O., Amajuoyi, P., Adeusi, K. B., & Scott, A. O. (2024). Blockchain-driven communication in banking: Enhancing transparency and trust with distributed ledger technology. *Finance & Accounting Research Journal*, 6(6), 851-867.
10. Onwubiko, Cyril. "Rethinking security operations centre onboarding." In *2021 International Conference on Cyber Situational Awareness, Data Analytics and Assessment (CyberSA)*, pp. 1-9. IEEE, 2021.
11. Lee, D. K. C., Shih, C. M., & Zheng, J. (2023). Asian CBDCs on the rise: An in-depth analysis of developments and implications. *Quant Financ Econ*, 7, 665-696.
12. Idrees, S. M., Nowostawski, M., Jameel, R., & Mourya, A. K. (2021). Security aspects of blockchain technology intended for industrial applications. *Electronics*, 10(8), 951.
13. Javaid, M., Haleem, A., Singh, R. P., Suman, R., & Khan, S. (2022). A review of Blockchain Technology applications for financial services. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, 2(3), 100073.
14. Tsang, Y. P., Wu, C.-H., Lam, H. Y., Choy, K. L., & Ho, G. T. (2021). Integrating Internet of Things and multi temperature delivery planning for perishable food E-commerce logistics: a model and application. *International Journal of Production Research*, 59(5), 1534-1556.
15. Tanwar, S. (2022). *Blockchain Technology*: Springer.
16. Zarrin, J., Wen Phang, H., Babu Saheer, L., & Zarrin, B. (2021). Blockchain for decentralization of internet: prospects, trends, and challenges. *Cluster Computing*, 24(4), 2841-2866.
17. Miyachi, K., & Mackey, T. K. (2021). hOCBS: A privacy-preserving blockchain framework for healthcare data leveraging an on-chain and off-chain system design. *Information Processing & Management*, 58(3), 102535.
18. Zhao, W. (2022). On blockchain: design principle, building blocks, core innovations, and misconceptions. *IEEE Systems, Man, and Cybernetics Magazine*, 8(4), 6-14.
19. Zhong, Y., Zhou, M., Li, J., Chen, J., Liu, Y., Zhao, Y., & Hu, M. (2021). Distributed blockchain-based authentication and authorization protocol for smart grid. *Wireless Communications and Mobile Computing*, 2021(1), 5560621.
20. Saad, M., Qin, Z., Ren, K., Nyang, D., & Mohaisen, D. (2021). e-PoS: Making proof-of-stake decentralized and fair. *IEEE Transactions on Parallel and Distributed Systems*, 32(8), 1961-1973.
21. Kshetri, N. (2021). Blockchain technology for improving transparency and citizen's trust. Paper presented at the *Advances in Information and Communication: Proceedings of the 2021 Future of Information and Communication Conference (FICC)*, Volume 1.
22. Zeba, S., Suman, P., & Tyagi, K. (2023). Types of blockchain. In *Distributed Computing to Blockchain* (pp. 55-68): Elsevier.
23. Shrimali, B., & Patel, H. B. (2022). Blockchain state-of-the-art: architecture, use cases, consensus, challenges and opportunities. *Journal of King Saud University-Computer and Information Sciences*, 34(9), 6793-6807.
24. Zeba, S., Suman, P., & Tyagi, K. (2023). Types of blockchain. In *Distributed Computing to Blockchain* (pp. 55-68): Elsevier.
25. Tseng, C.-T., & Shang, S. S. (2021). Exploring the sustainability of the intermediary role in blockchain. *Sustainability*, 13(4), 1936.
26. Garg, R. (2023). Blockchain for Decentralized Finance: Impact, Challenges and Remediation. *International Journal of Computer and Information Engineering*, 17(3), 225-237.
27. Drummer, D., & Neumann, D. (2020). Is code law? Current legal and technical adoption issues and remedies for blockchain-enabled smart contracts. *Journal of information technology*, 35(4), 337-360.
28. Udeh, E. O., Amajuoyi, P., Adeusi, K. B., & Scott, A. O. (2024a). Blockchain-driven communication in banking: Enhancing transparency and trust with distributed ledger technology. *Finance & Accounting Research Journal*, 6(6), 851-867.
29. Udeh, E. O., Amajuoyi, P., Adeusi, K. B., & Scott, A. O. (2024b). The role of Blockchain technology in enhancing transparency and trust in green finance markets. *Finance & Accounting Research Journal*, 6(6), 825-850.