West Science Social and Humanities Studies
Vol. 03, No. 11, November 2025, pp. 1640-1652

Bibliometric Mapping of Triple-Entry Accounting and Machine Learning Applications in Financial Transparency

Loso Judijanto
IPOSS Jakarta, Indonesia

Article Info

Article history:

Received Nov, 2025
Revised Nov, 2025
Accepted Nov, 2025

Keywords:

Triple-Entry Accounting
Blockchain
Machine Learning
Financial Transparency
Distributed Ledger Technology

ABSTRACT

This study examines the emerging convergence of triple-entry accounting, blockchain technology, and machine learning as a transformative framework for enhancing financial transparency. Using a bibliometric analysis of Scopus-indexed publications from 2000 to 2025, the research identifies key intellectual structures, thematic clusters, and temporal trends that shape this field. The results show that blockchain serves as the foundational infrastructure enabling immutable, verifiable accounting records, while machine learning functions as an analytical layer that strengthens anomaly detection, continuous auditing, and fraud prevention. Triple-entry accounting is found to be evolving from a conceptual innovation into a practical accounting architecture supported by cryptographic verification and distributed ledger systems. The study highlights significant implications for auditors, regulators, and organizations seeking to modernize financial reporting through automation and secure digital ecosystems. Although promising, the research also notes limitations related to data scope, conceptual depth, and the need for empirical validation. Overall, the findings underscore the potential of technologically integrated accounting systems to redefine trust, accountability, and transparency in modern financial environments.

Corresponding Author:

Name: Loso Judijanto
Institution: IPOSS Jakarta, Indonesia
Email: losojudijantobumn@gmail.com

1. INTRODUCTION

The rapid advancement of digital technologies has transformed traditional financial reporting systems, prompting scholars and practitioners to re-examine the foundations of accounting transparency in an increasingly complex economic environment [1]. Conventional double-entry accounting, which has dominated financial record-keeping for more than five centuries, is now confronted with new expectations for real-time verification, immutable documentation, and fraud-resistant processes. As organizations expand their operations across digital platforms and global supply chains, the limitations of double-entry frameworks—particularly their vulnerability to manipulation and delayed verification—are more visible than ever [2], [2], [3]. This context has encouraged researchers to explore innovative systems that strengthen the integrity and auditability of financial information.

In this evolving landscape, the concept of **triple-entry accounting** has emerged as a promising paradigm. Introduced conceptually by [4] and later developed within blockchain-based applications, triple-entry systems incorporate an independent, cryptographically secured third ledger that records and validates transactions. Unlike double-entry formats where each entity maintains internal accounts that require reconciliation, triple-entry systems generate tamper-resistant receipts shared between transacting parties and validated by an impartial system. Scholars argue that such mechanisms significantly reduce opportunities for earnings manipulation, illicit financial flows, and fraudulent reporting [5], [6]. As a result, triple-entry accounting has gained growing attention in financial governance, audit research, and public sector transparency programs.

Parallel to these technological shifts, machine learning (ML**)** has increasingly been adopted within the accounting and auditing fields. ML offers sophisticated tools for detecting financial anomalies, identifying suspicious patterns, and automating compliance monitoring. The integration of ML techniques such as supervised classification, anomaly detection algorithms, neural networks, and natural language processing enables organizations to analyze large volumes of transactional data with unprecedented accuracy and speed [7]. When applied to triple-entry infrastructures, ML further enhances the ability to verify transactions, predict fraudulent behaviors, and support continuous auditing practices. This synergy between triple-entry accounting and ML has opened new pathways for research on automated financial assurance.

Moreover, governments, regulators, and international organizations are increasingly emphasizing the need for transparent, accountable, and real-time financial reporting systems. Public attention to corruption, tax evasion, financial misconduct, and corporate scandals has placed additional pressure on institutions to modernize their financial control mechanisms. According to [8], transparency is no longer perceived as a compliance requirement alone but as a strategic capability that enhances public trust and institutional legitimacy. In this regard, triple-entry accounting combined with ML applications represents a strategic response to global demands for trustworthy financial ecosystems. Despite its potential, the practical adoption of triple-entry accounting remains limited, primarily due to a scarcity of empirical studies, implementation frameworks, and integrated technological models. Researchers continue to debate questions related to system scalability, interoperability, data governance, and organizational readiness [9]. Similarly, while ML has demonstrated strong capabilities in fraud detection and predictive analytics, its integration with cryptographically secured accounting systems is still at an early stage. Therefore, understanding how triple-entry accounting and ML can jointly improve financial transparency is an important research area that addresses both theoretical and practical challenges in the digital economy.

Although triple-entry accounting and machine learning have independently shown significant potential to improve the quality and reliability of financial information, research integrating both approaches remains underdeveloped. Current literature tends to examine triple-entry accounting primarily through the lens of blockchain infrastructure without fully exploring how ML could enhance automated auditing, anomaly detection, and real-time verification. Conversely, ML studies often focus on traditional accounting datasets that lack the immutable structure offered by triple-entry systems. As a result, there is a theoretical and practical gap concerning how these two technologies can be combined to create a more transparent, secure, and predictive financial reporting ecosystem. This study seeks to address the absence of a coherent conceptual framework and empirical discussion regarding the joint application of triple-entry accounting and ML to improve financial transparency.

This study aims to develop a comprehensive understanding of how triple-entry accounting and machine learning applications can be integrated to strengthen financial transparency across organizational and institutional contexts. Specifically, the study examines the conceptual foundations, technological mechanisms, and potential implementation models that support the synergy between cryptographically secured accounting systems and data-driven analytical tools. By synthesizing current theoretical developments, empirical insights, and emerging technological trends, this research provides a structured model for assessing how triple-entry accounting and ML can enhance verifiability, detect anomalies more efficiently, and support continuous auditing processes within modern financial ecosystems.

2. METHODS

This study adopts a bibliometric research design supported by science-mapping techniques to analyze the development of scholarship on triple-entry accounting and machine learning applications in financial transparency. Bibliometric analysis was chosen because it enables researchers to systematically evaluate publication trends, influential authors, citation patterns, and thematic evolution within a rapidly emerging interdisciplinary field. The Scopus database was used as the primary data source due to its comprehensive coverage of peer-reviewed publications across accounting, information systems, computer science, and financial management. To ensure adequate representation of conceptual foundations and technological advancements, the study included all relevant literature published between 2000 and 2025, capturing both early conceptual debates about next-generation accounting infrastructure and contemporary discussions on machine learning–based financial analytics.

Data collection followed a structured search protocol. Relevant publications were retrieved using a combination of controlled keywords such as *"triple-entry accounting," "blockchain accounting," "cryptographic receipts," "machine learning," "financial transparency," "continuous auditing,"* and *"fraud detection algorithms."* Boolean operators (AND, OR) were applied to refine search accuracy and exclude irrelevant items. Only articles, book chapters, and conference papers from peer-reviewed sources indexed in Scopus were included, while non-academic documents, editorial notes, and duplicates were excluded. The final dataset was exported in RIS and CSV formats for analysis. Metadata fields—including author names, affiliations, keywords, abstracts, publication years, and citation counts—were extracted to support descriptive and network analyses.

The analytical process employed VOSviewer and Bibliometrix R-package to generate co-authorship networks, keyword co-occurrence maps, thematic clusters, and citation structures. These tools enabled identification of dominant research streams, emerging thematic areas, and structural relationships between accounting innovation and machine learning applications. A thematic evolution analysis was conducted to determine how the discourse transitioned from early blockchain-oriented accounting studies to more advanced integrations involving predictive modeling and algorithmic assurance. The results of these analyses were then synthesized qualitatively to propose a conceptual model illustrating how triple-entry accounting and machine learning jointly contribute to enhancing financial transparency. This mixed bibliometric–qualitative approach ensures methodological rigor while capturing the depth and complexity of technological transformations in modern accounting.

3. RESULTS AND DISCUSSION

3.1 Keyword Co-Occurrence Network

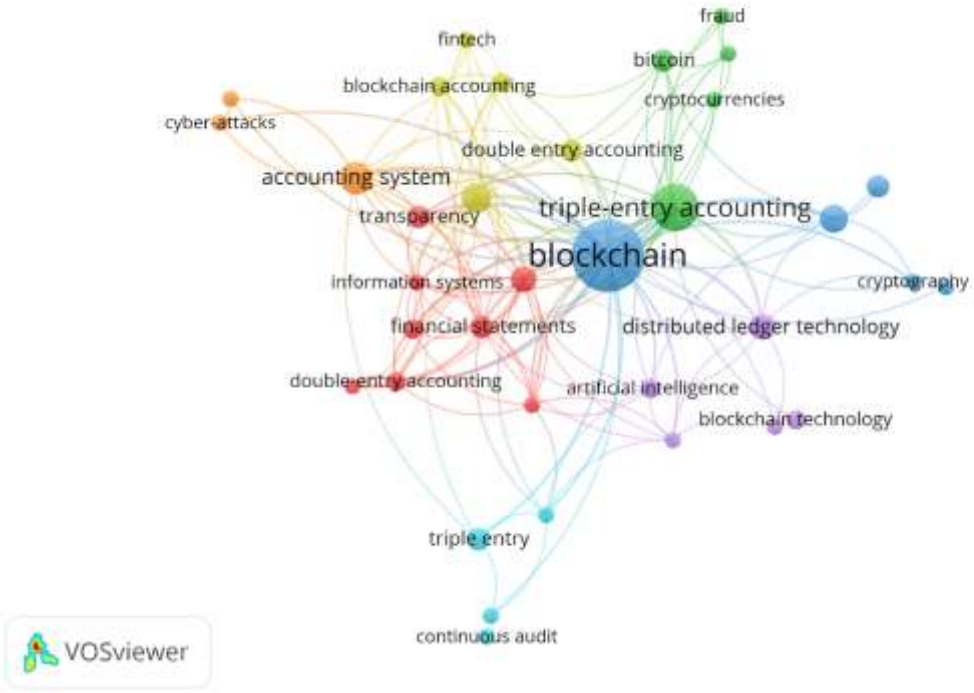

Figure 1. Network Visualization
Source: Data Analysis Result, 2025

The VOSviewer visualization illustrates the intellectual structure of research connecting triple-entry accounting, blockchain technology, and machine learning–driven financial transparency. The largest and most central node "blockchain" indicates that blockchain acts as the conceptual hub of the literature, linking both traditional accounting concepts and advanced digital technologies. Its strong connections to terms such as *triple-entry accounting*, *distributed ledger technology*, *cryptography*, and *cryptocurrencies* show that research in this domain is primarily driven by the evolution of cryptographically enabled financial record-keeping systems. The high density of links surrounding *triple-entry accounting* demonstrates that scholars increasingly view it as a transformative model for achieving verifiable, tamper-proof financial records.

Several distinct clusters emerge in the network, each representing a thematic research stream. The blue-purple cluster highlights the technological foundations of triple-entry accounting, connecting *cryptography*, *distributed ledger technology*, and *blockchain technology*. This cluster emphasizes that the technical backbone of transparency improvements lies in immutable, decentralized systems that secure transaction data. The red and yellow cluster relates to traditional accounting functions with keywords like *financial statements*, *double-entry accounting*, *information systems*, and *accounting system* indicating that researchers are actively comparing legacy accounting processes with new cryptographic models. The strong linkages between these clusters suggest an ongoing dialogue about how digital technologies can either complement or replace conventional reporting structures.

A separate green cluster connects *fraud*, *bitcoin*, and *cryptocurrencies*, reflecting studies that focus on risk mitigation, fraud prevention, and the forensic aspects of blockchain-based accounting. Meanwhile, the orange cluster, containing terms like *cyber-attacks* and *fintech*, shows that cybersecurity and digital innovation are critical considerations in developing transparent accounting ecosystems. Finally, the light-blue cluster with *continuous audit* and *triple entry* signifies a growing research trend focused on real-time auditing and machine-assisted

verification. The connections between *artificial intelligence* and other accounting terms show the expanding role of predictive analytics and anomaly detection in ensuring transparency.

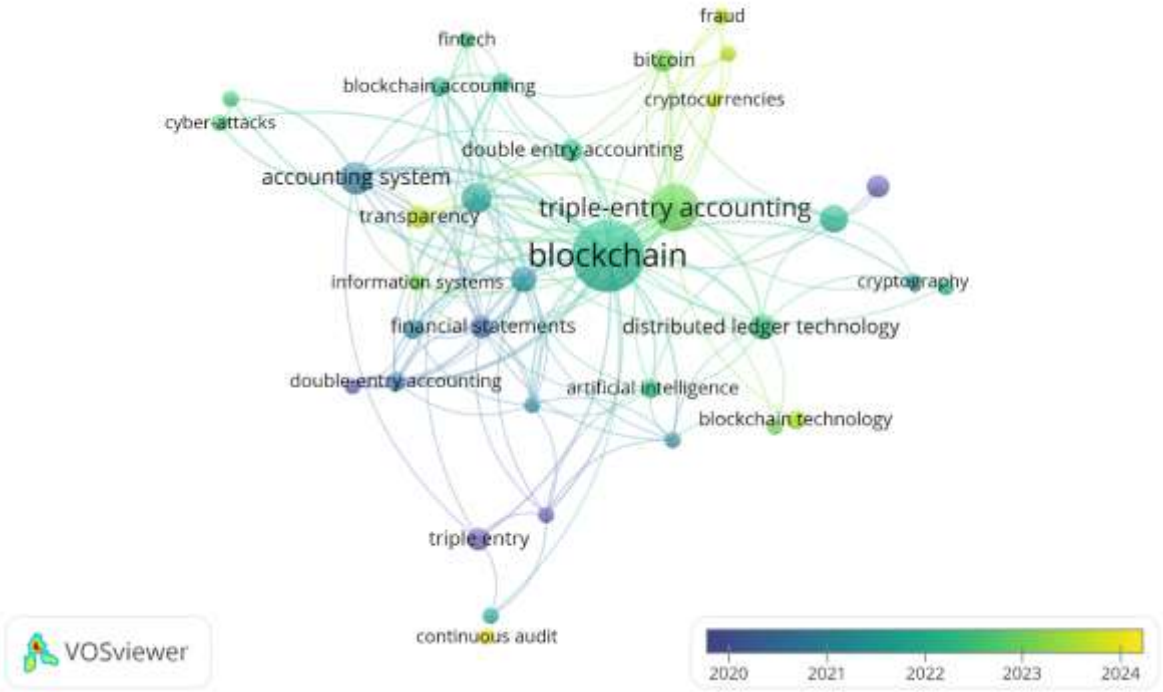

Figure 2. Overlay Visualization
Source: Data Analysis Result, 2025

The overlay visualization presents the temporal evolution of research on triple-entry accounting, blockchain, and machine learning from 2020 to 2024. The color scale from blue (older) to yellow (newer) indicates the average publication year of each keyword. This allows us to see how scholarly attention has shifted across different themes over time. In the earlier years (2020–2021), the map shows strong emphasis on foundational concepts such as *double-entry accounting*, *financial statements*, *information systems*, and *distributed ledger technology*, which appear in darker blue tones. This suggests that early studies focused on establishing conceptual comparisons between traditional accounting systems and blockchain-based infrastructures. These foundational discussions primarily explored the limitations of double-entry mechanisms and introduced the theoretical potential of triple-entry accounting as an enhancement for financial integrity and auditability.

As research progressed into 2022–2023, the dominant keywords shifted toward more technical and integrative themes such as *triple-entry accounting*, *blockchain*, *blockchain technology*, and *cryptography*, shown in greenish tones. This period reflects the transition from conceptual debates to more practical investigations into how cryptographic verification, distributed ledger structures, and blockchain protocols can be operationalized in accounting systems. The strong interconnectivity of keywords during this timeframe indicates growing interdisciplinary collaboration between accounting scholars, information system researchers, and computer scientists.

The most recent research streams (2023–2024) are represented by yellow and light green nodes, including *cryptocurrencies*, *bitcoin*, *fraud*, and *fintech*. These emerging themes demonstrate a contemporary shift in focus toward risk assessment, fraud analytics, and the financial implications of blockchain adoption in real-world transactions. The

heightened visibility of *artificial intelligence* and *continuous audit* in newer colors also indicates a rising interest in combining machine learning with triple-entry accounting to support real-time anomaly detection, automated auditing, and predictive governance. The integration of cybersecurity concerns, highlighted through keywords like *cyber-attacks*, underscores how transparency research increasingly intersects with digital risk management.

.

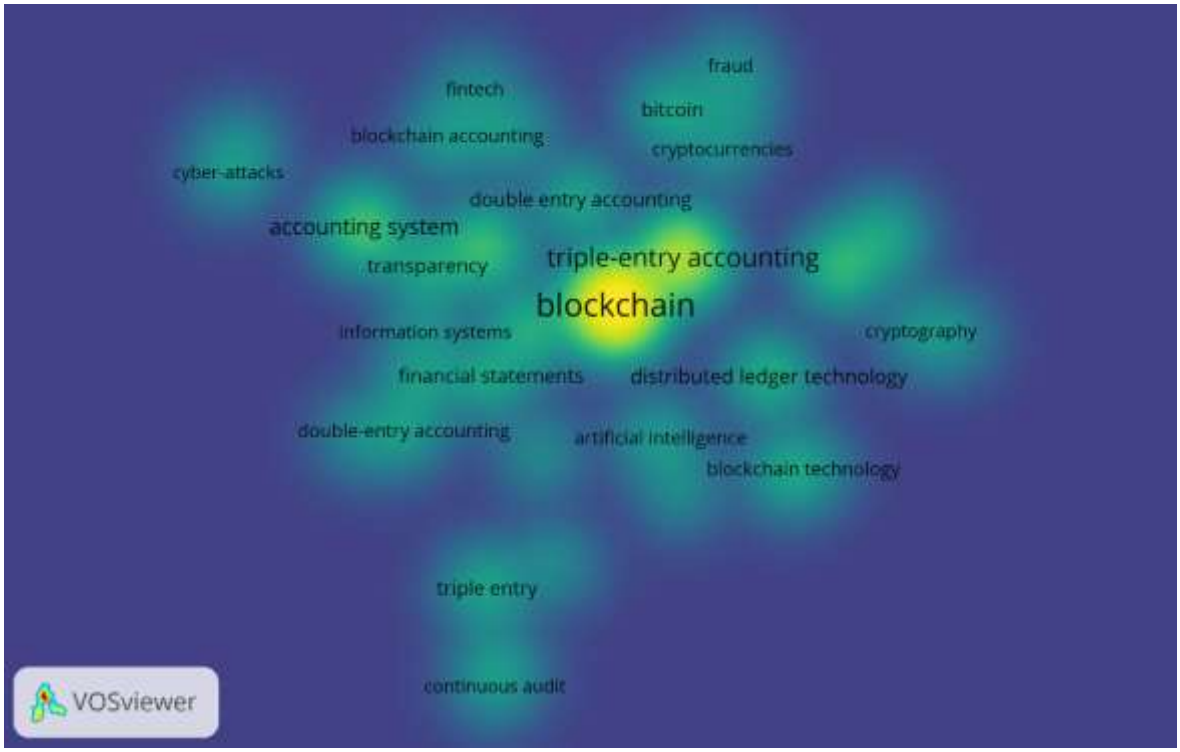

Figure 3. Density Visualization

Source: Data Analysis, 2025

The density visualization highlights the research intensity surrounding key concepts in the literature on triple-entry accounting, blockchain, and machine learning applications for financial transparency. Areas with yellow and bright green colors represent keywords that appear most frequently and have strong co-occurrence relationships, indicating dominant themes in the research field. In contrast, blue and dark areas indicate less densely studied topics, reflecting more specialized or emerging niches within the domain.,

At the center of the map, "blockchain" appears as the brightest and densest point, confirming its position as the primary conceptual anchor of the entire research area. Its strong density indicates that blockchain serves as the foundational technology underpinning discussions about triple-entry accounting, distributed ledgers, financial transparency, and digital auditing. Closely surrounding it, "triple-entry accounting" also shows a high-intensity zone, suggesting that this concept has become increasingly central as scholars explore alternatives to traditional accounting systems. The proximity and density of keywords such as *distributed ledger technology*, *cryptography*, and *blockchain technology* indicate that much of the core literature is technologically driven, emphasizing secure, decentralized infrastructures for improving financial verification.

The map also reveals moderate-density clusters involving traditional accounting concepts, including *financial statements*, *information systems*, and *double-entry accounting*. These appear in greenish zones, indicating that while they remain

significant, they are not as central as blockchain-based themes. Their presence shows that researchers are actively comparing traditional accounting mechanisms with emerging triple-entry approaches, particularly in terms of reliability, transparency, and resistance to fraud. Several peripheral keywords—such as *continuous audit*, *triple entry*, *cyber-attacks*, *fintech*, and *artificial intelligence* appear in lower-density (blue-green) regions. These represent emerging but less frequently studied subtopics. Their placement indicates growing interest but lower saturation, suggesting that future research is likely to expand in these directions. For example, the position of *artificial intelligence* near blockchain-related keywords points toward increasing exploration of machine learning in automated auditing and fraud detection. Similarly, *cyber-attacks* and *fintech* reflect expanding concerns about security risks and digital innovation in accounting ecosystems.

.

3.2 Co-Authorship Network

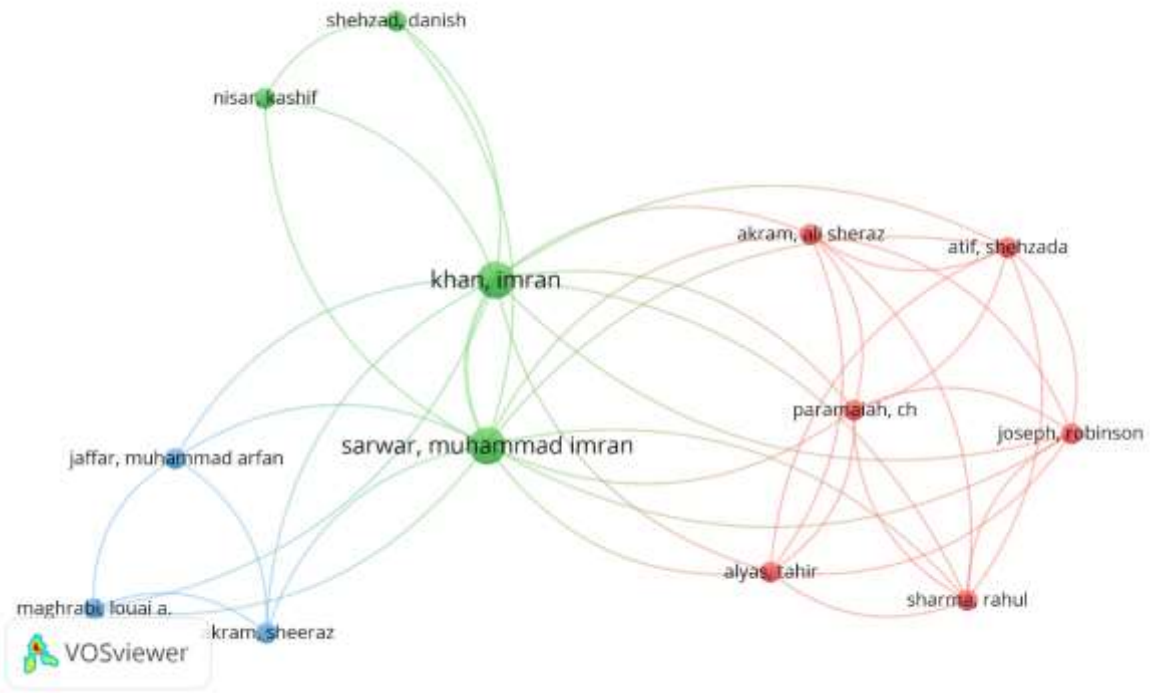

Figure 4. Author Collaboration Visualization
Source: Data Analysis, 2025

The co-authorship network visualization illustrates the structure of scholarly collaboration within the research field, revealing three distinct clusters of authors who are interconnected to varying degrees. At the center of the map lies the most influential and collaborative group, represented by the green cluster, where Imran Khan and Muhammad Imran Sarwar emerge as the principal hubs. Their prominent node sizes and numerous connecting lines indicate that they serve as the main intellectual anchors of the field, regularly co-authoring with one another and maintaining strong connections with several other researchers such as Danish Shehzad, Kashif Nisar, and Sheeraz Akram. The high density of interactions within this cluster suggests long-term collaborative partnerships, shared institutional backgrounds, or sustained engagement in similar research themes. Their centrality also allows them to function as bridging scholars who connect otherwise separate research communities.

To the right of the visualization, the red cluster represents another cohesive author team, characterized by dense internal linkages and focused collaborative activity. Researchers like Atif Shehzada, Ali Sheraz Akram, CH Paramajaih, Joseph Robinson, Rahul Sharma, and Tahir Alyas form a tightly interconnected community, frequently publishing together and likely working within a shared thematic or institutional environment. Although this cluster maintains its own strong internal identity, it also connects to the central green cluster through the collaborative ties of key authors, indicating partial integration into the broader research landscape. This connectivity suggests that while the red group has a distinct research focus, its members still contribute actively to the central discourse shaped by Khan and Sarwar.

The blue cluster on the left side reflects a smaller and more peripheral collaboration group, involving authors such as Muhammad Arfan Jaffar and Louai A. Maghrabi, who work more independently from the mainstream research core. Their limited but notable connections—often mediated by Sheeraz Akram suggest that they occupy a more specialized or emerging position within the field. While they are not as deeply integrated as the central cluster, their presence highlights the field's expanding boundaries and the inclusion of diverse scholarly inputs.

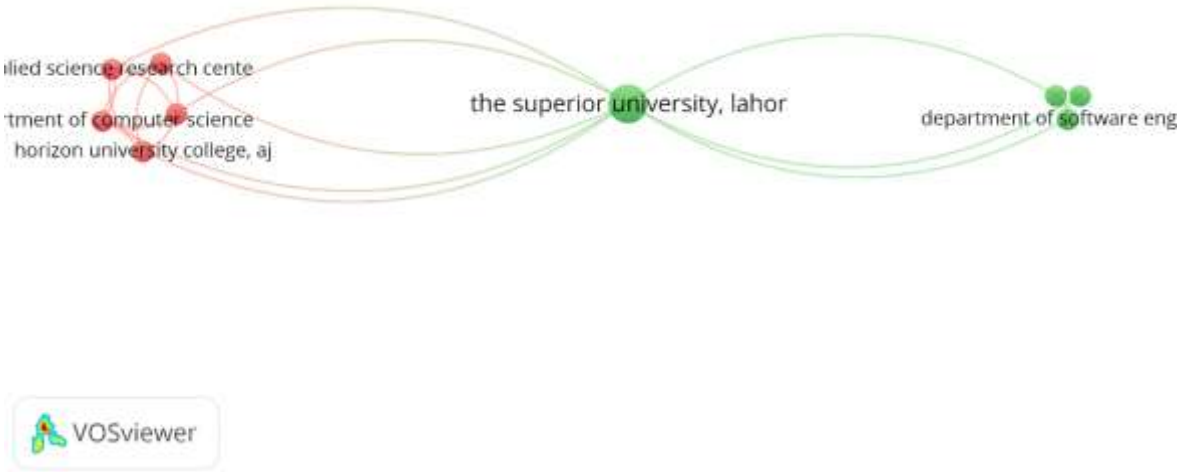

Figure 5. Affiliation Collaboration Visualization
Source: Data Analysis, 2025

The institutional collaboration network illustrates a relatively centralized structure in which The Superior University, Lahore acts as the primary institutional hub linking two distinct groups of collaborating institutions. Positioned at the center of the visualization, its larger node size and multiple connecting lines indicate that it is the most active and influential institution within the dataset, serving as a bridge between research partners on both sides of the network. On the left side, the red-colored cluster includes institutions such as Applied Science Research Centre, the Department of Computer Science, and Horizon University College, AJ, which are tightly connected to each other,

suggesting frequent co-authorship and shared academic initiatives. Their links to The Superior University, Lahore indicate that while this cluster collaborates internally, it depends on the central institution to connect with the broader research community.

On the right side, the green cluster composed of the Department of Software Engineering and its associated subunits demonstrates another concentrated collaborative grouping. Their strong ties to The Superior University, Lahore suggest a close institutional affiliation or joint research ecosystem, possibly within similar academic programs or faculty networks. Overall, the map reveals that The Superior University, Lahore functions as the key integrator that fosters cross-institutional collaboration, linking otherwise separate clusters and facilitating the flow of knowledge across the research landscape.

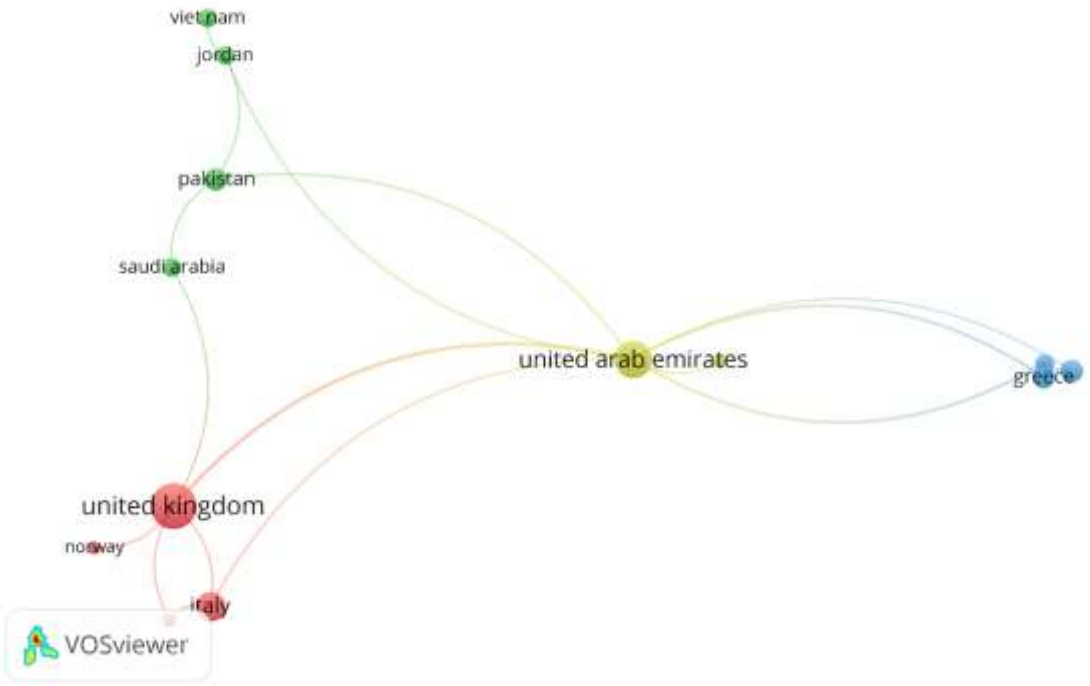

Figure 6. Country Collaboration Visualization
Source: Data Analysis, 2025

The country collaboration network reveals a structure in which the United Arab Emirates (UAE) functions as the central hub, linking several geographically diverse research partners. Its prominent node size and multiple outgoing connections indicate that it is the most active and influential country in fostering international collaboration within this research domain. To the left of the map, a cluster of countries including Pakistan, Saudi Arabia, Jordan, and Vietnam is connected to the UAE through moderately strong links, suggesting that these nations frequently collaborate with UAE-based scholars, likely through joint projects or shared institutional affiliations. On the lower left, the United Kingdom forms another significant collaboration center, with dense ties to countries such as Italy and Norway, forming a European research cluster.

Its additional connection to the UAE reflects cross-regional cooperation between Europe and the Middle East. On the right side of the network, Greece appears as a smaller, more independent cluster, maintaining selective but notable connections to the UAE, indicating participation in targeted co-authorships or project-based relationships. Overall, the visualization demonstrates that the UAE plays a pivotal bridging role

connecting Asian, Middle Eastern, and European countries, thereby facilitating cross-regional knowledge exchange and forming the backbone of international scholarly collaboration in this field.

3.3 Citation Analysis

The bibliometric data above identifies the ten most significant articles in the domain of Fear of.

Table 1. Top Cited Research

Citations	Authors and year	Title
335	[10]	Accounting and auditing with blockchain technology and artificial Intelligence: A literature review
114	[11]	Triple-entry accounting with blockchain: How far have we come?
94	[12]	Blockchain, enterprise resource planning (ERP) and accounting information systems (AIS): Research on e-procurement and system integration
87	[13]	Blockchain in accounting practice and research: systematic literature review
80	[14]	Overview and impact of blockchain on auditing
73	[15]	Blockchain adoption in accounting by an extended UTAUT model: empirical evidence from an emerging economy
60	[16]	Integrated cloud financial accounting cycle. How artificial intelligence, blockchain, and XBRL will change the accounting, fiscal and auditing practices
55	[17]	Accounting information systems in the blockchain era
35	[18]	Blockchain Technology as an Ecosystem: Trends and Perspectives in Accounting and Management
34	[19]	How can NGO accountability practices be improved with technologies such as blockchain and triple-entry accounting?

Source: Scopus, 2025

The citation table highlights the most influential publications at the intersection of blockchain, artificial intelligence, and modern accounting systems, revealing a research landscape that has rapidly matured between 2019 and 2023. The most cited work, by [10] with 335 citations, provides a comprehensive literature review on blockchain and AI in accounting and auditing. Its high citation count reflects the growing importance of integrated digital technologies in reshaping assurance, risk management, and financial reporting. This publication appears to act as a foundational reference for scholars seeking to understand how emerging technologies jointly influence modern accounting practices, signaling a shift toward intelligent, automated ecosystems.

Another highly influential study is [11] with 114 citations, which evaluates the progress of triple-entry accounting using blockchain. Cai's work is particularly important because it directly addresses the conceptual evolution of accounting ledgers, questioning the readiness of triple-entry systems for mainstream adoption. This study serves as a critical touchpoint for subsequent research exploring the technical, regulatory, and organizational challenges of implementing cryptographically secured accounting infrastructure. Complementing this, [12] contribute 94 citations through research on blockchain integration within ERP and AIS systems, emphasizing how e-procurement and system interoperability shape organizational transformation. Their findings underscore the need for seamless system integration as firms adopt blockchain-enabled financial workflows.

Publications from [13] and [14] further establish blockchain as a transformative force in both accounting practice and auditing. Bellucci's systematic review (87 citations) maps the academic discourse, identifying existing gaps and future research opportunities. In contrast,

Bonyuet's earlier work (80 citations) provides foundational insights into how blockchain reshapes assurance processes, influencing audit reliability and transparency. Together, these works illustrate a transition from early conceptual explorations to more practice-oriented investigations focused on real-world adoption.

The growing interest in technology acceptance is evident through [15], whose study on blockchain adoption using an extended UTAUT model (73 citations) provides empirical evidence from emerging economies. This marks a significant shift from purely theoretical contributions to research grounded in behavioural and organizational adoption dynamics. Meanwhile, [1] offer an early holistic view of integrated cloud accounting cycles, highlighting how AI, blockchain, and XBRL collectively redefine the accounting, fiscal, and auditing landscape. Their work foreshadows the convergence of multiple digital technologies within financial ecosystems. The evolution of accounting information systems in a blockchain environment is captured by [17] with 55 citations, underscoring how AIS architectures must adapt to decentralized operational models. This theme is continued by [18], who conceptualize blockchain technology as an ecosystem, analyzing its implications for accounting and management more broadly. Finally, [19] extend the conversation beyond corporate settings by examining how NGOs can enhance accountability through blockchain and triple-entry accounting. With 34 citations, their study demonstrates the versatility of blockchain-enabled accountability systems across diverse organizational contexts.

Discussion

The findings of this bibliometric exploration reveal a rapidly expanding and multidisciplinary body of knowledge that positions triple-entry accounting and machine learning (ML) as pivotal elements in the future of financial transparency. Through the co-occurrence, overlay, and density visualizations, it becomes evident that blockchain remains at the center of scholarly conversations, functioning as the technological backbone that enables secure, immutable, and verifiable financial recordkeeping. The increasing intensity of keywords such as *triple-entry accounting*, *distributed ledger technology*, *cryptography*, and *artificial intelligence* demonstrates a progressive shift from conceptual exploration toward system integration and practical application. This trajectory highlights an important trend: researchers are no longer focused solely on theoretical possibilities, but increasingly on the operational challenges and technological synergies required to realize transparent, real-time, and fraud-resistant accounting ecosystems.

The temporal analysis further supports this development. Between 2020 and 2021, the field was primarily concerned with understanding blockchain's potential as a disruptive innovation relative to traditional double-entry accounting. Scholars examined the vulnerabilities of conventional systems, particularly the lack of independent verification and susceptibility to manipulation. By 2022 and 2023, discussions shifted toward the engineering of triple-entry accounting systems, integrating cryptographic receipts and distributed verification mechanisms. These foundational conversations laid the groundwork for emerging research in 2023–2024, where machine learning, fintech, cybersecurity, and fraud detection became more prominent. The evolution illustrates a maturing research field that is steadily moving from conceptual feasibility to operational sophistication.

The co-authorship and institutional networks reinforce this observation. Collaboration patterns show a growing concentration of scholars who bridge accounting, information systems, cryptography, and AI. The presence of strong interdisciplinary teams in regions such as the UAE, the United Kingdom, Pakistan, and Greece suggests that global interest is converging toward cross-functional innovation. Institutions like The Superior University, Lahore, and the Department of Software Engineering appear to play significant bridging roles, linking technical

expertise with accounting research. Such collaboration is essential, as building triple-entry accounting systems requires the convergence of domain knowledge from accounting theory, blockchain architecture, algorithm design, and cybersecurity.

Taken together, these findings underscore that the field is moving toward a holistic understanding that financial transparency cannot be achieved through technological innovation alone. Instead, it requires an integrated ecosystem where triple-entry mechanisms, machine learning, cloud accounting systems, and organizational readiness coexist. This combination not only strengthens audit quality but also enhances early detection of fraud, improves compliance monitoring, and facilitates continuous assurance. The scholarly landscape demonstrates that transparency is now conceptualized not merely as a governance requirement, but as a digitally enabled capability that contributes to institutional trust, regulatory compliance, and operational efficiency.

4. CONCLUSION

This study demonstrates that the intersection of triple-entry accounting, blockchain technology, and machine learning represents one of the most transformative developments in modern accounting and auditing. Through bibliometric analysis covering the period 2000–2025, the research reveals a clear evolution of scholarly attention: from early conceptual debates about blockchain's potential to replace or enhance double-entry systems, toward more sophisticated explorations of cryptography, distributed ledgers, artificial intelligence, and real-time verification. The co-occurrence, density, and temporal visualizations collectively show that blockchain serves as the technological core of this field, while machine learning emerges as a complementary intelligence layer that enables anomaly detection, continuous auditing, and predictive transparency.

The findings highlight that triple-entry accounting is no longer merely an experimental concept but is gradually transitioning into a viable accounting architecture supported by strong technical foundations and increasing empirical interest. Machine learning strengthens this transition by enabling proactive risk detection and enhancing the credibility of audit processes. Together, these technologies shift the role of accounting from a historical recording function to a dynamic, automated, and tamper-resistant system of verification. The study further reveals that global collaboration—particularly among institutions and countries linked through blockchain and AI research—is accelerating theoretical and practical advancements.

Practically, the integration of these technologies offers organizations a pathway to more transparent, secure, and efficient financial ecosystems. Auditors gain access to immutable records and automated monitoring capabilities, regulators benefit from improved compliance visibility, and organizations can reduce fraud risk while enhancing stakeholder trust. Theoretically, the study contributes by reframing accounting as a distributed verification mechanism supported by intelligent analytics, expanding existing models of assurance, accountability, and system integration.

However, several limitations remain. Bibliometric methods cannot fully capture the depth of conceptual contributions, and the rapid pace of technological change may soon alter the research landscape. There is also a need for more empirical and experimental studies to validate implementation challenges, governance implications, and user adoption factors in real-world environments.

REFERENCES

[1] A. I. Weinberg and A. Faccia, "Transforming Triple-Entry Accounting with Machine Learning: A Path to Enhanced Transparency Through Analytics," *arXiv Prepr. arXiv2411.15190*, 2024.

[2] K. Sgantzos, M. Al Hemairy, P. Tzavaras, and S. Stelios, "Triple-entry accounting as a means of auditing large language models," *J. Risk Financ. Manag.*, vol. 16, no. 9, p. 383, 2023.

[3] T. M. Petrović, L. Ž. Tanasić, and Ž. Jovičić, "SECURITY AND TRANSPARENCY IN FINANCIAL REPORTING: TRANSFORMATION THROUGH TRIPLEENTRY ACCOUNTING.," *New Econ. Ekon.*, vol. 18, no. 36, 2024.

[4] O. Akajagbor and O. Ilaboya, "Triple-Entry Accounting: Transcending the Double-Entry System," *Available SSRN 5186737*, 2024.

[5] P. Dixit, H. Harwani, R. Amarsela, K. Patel, and M. J. Patel, "Incorporating triple entry accounting as an audit tool—enhancing modern accounting systems," *J. Informatics Educ. Res.*, vol. 4, no. 2, 2024.

[6] K. Sgantzos, P. Tzavaras, M. Al Hemairy, and E. R. Porras, "Triple-Entry Accounting and Other Secure Methods to Preserve User Privacy and Mitigate Financial Risks in AI-Empowered Lifelong Education," *J. Risk Financ. Manag.*, vol. 18, no. 4, p. 176, 2025.

[7] M. Maiti, I. Kotliarov, and V. Lipatnikov, "A future triple entry accounting framework using blockchain technology," *Blockchain Res. Appl.*, vol. 2, no. 4, p. 100037, 2021.

[8] J. I. Ibañez, D. C. N. Bayer, P. Tasca, and J. Xu, "The efficiency of single truth: Triple-entry accounting," *Available SSRN 3770034*, 2021.

[9] E. K. Chowdhury, "Financial accounting in the era of blockchain-a paradigm shift from double entry to triple entry system," *Available SSRN 3827591*, 2021.

[10] H. Han, R. K. Shiwakoti, R. Jarvis, C. Mordi, and D. Botchie, "Accounting and auditing with blockchain technology and artificial Intelligence: A literature review," *Int. J. Account. Inf. Syst.*, vol. 48, p. 100598, 2023.

[11] C. W. Cai, "Triple-entry accounting with blockchain: How far have we come?," *Account. Financ.*, vol. 61, no. 1, pp. 71–93, 2021.

[12] A. Faccia and P. Petratos, "Blockchain, enterprise resource planning (ERP) and accounting information systems (AIS): Research on e-procurement and system integration," *Appl. Sci.*, vol. 11, no. 15, p. 6792, 2021.

[13] M. Bellucci, D. Cesa Bianchi, and G. Manetti, "Blockchain in accounting practice and research: systematic literature review," *Meditari Account. Res.*, vol. 30, no. 7, pp. 121–146, 2022.

[14] D. Bonyuet, "Overview and impact of blockchain on auditing," *Int. J. Digit. Account. Res.*, vol. 20, pp. 31–43, 2020.

[15] M. M. A. Afifa, H. V. Van, and T. L. H. Van, "Blockchain adoption in accounting by an extended UTAUT model: empirical evidence from an emerging economy," *J. Financ. Report. Account.*, vol. 21, no. 1, pp. 5–44, 2022.

[16] A. Faccia, M. Y. K. Al Naqbi, and S. A. Lootah, "Integrated cloud financial accounting cycle: how artificial intelligence, blockchain, and XBRL will change the accounting, fiscal and auditing practices," in *Proceedings of the 2019 3rd International Conference on Cloud and Big Data Computing*, 2019, pp. 31–37.

[17] O. Fullana and J. Ruiz, "Accounting information systems in the blockchain era," *Int. J. Intellect. Prop. Manag.*, vol. 11, no. 1, pp. 63–80, 2021.

[18] T. Kitsantas and E. Chytis, "Blockchain technology as an ecosystem: Trends and perspectives in accounting and management," *J. Theor. Appl. Electron. Commer. Res.*, vol. 17, no. 3, pp. 1143–1161, 2022.

[19] S. C. Kuruppu, D. Dissanayake, and C. de Villiers, "How can NGO accountability practices be improved with technologies such as blockchain and triple-entry accounting?," *Accounting, Audit. Account. J.*, vol. 35, no. 7, pp. 1714–1742, 2022.