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Blockchain Applications in Accounting and Auditing: Research Trends and Future Research Implications

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Abstract

Blockchain applications in accounting and auditing are crucial because they can revolutionize transparency, security, and efficiency in financial record-keeping. This paper examines the current research trends and future implications of using blockchain in accounting and auditing. This study uses scholarly articles from the Scopus database for bibliographic analysis to reveal research patterns, geographical circumstances, thematic trends, collaboration links, and findings that can shape future research and policies on blockchain's impact on accounting and auditing practices. Recently, there has been a significant increase in publications, indicating a growing interest in this field. Among countries, UK had the highest international cooperation, with substantial contributions and a steady level of engagement. Keyword trends show a growing focus on blockchain integration with big data technologies to get the organization involved in auditing and accounting. Privacy and digital technology were identified as emerging themes that need attention. Among the top sources of publications were Financial and Credit Activity: Problems of Theory and Practice and the International Journal of Digital Accounting Research. The research highlights significant challenges in adopting blockchain technology within accounting and auditing: ensuring security and security, adopting the regulatory framework and deriving the economic value and suggests integrated governance models, redesigning regulatory frameworks, and responsible technological advancements like AI to address widespread adoption of blockchain technology in accounting and auditing.

Keywords: Blockchain, Accounting, Auditing, Security, Transparency, Bibliometric and Future research.

Vol. 8, No.07; 2024

ISSN: 2456-7760

1. Introduction

Improved efficiency, security, and openness are just a few ways in which blockchain technology is changing the face of auditing and accounting. Blockchain technology eliminates the possibility of fraud and mistakes in financial records by providing a distributed ledger that cannot be altered (Dai & Vasarhelyi, 2017). Financial reporting can now be more precise and up to date because of this technology's real-time transaction recording and verification capabilities (PWC, 2019). According to Rozario and Vasarhelyi (2018), auditors can now access real-time data and check transactions nearly instantly, thanks to blockchain technology, which allows continuous auditing. This greatly streamlines the audit process and increases its dependability. Additionally, smart contracts may automate and enforce accounting rules and laws, decreasing manual intervention and assuring compliance (EY, 2020). Smart contracts are agreements that are encoded into code and can execute themselves. With blockchain technology, audits and accounting can be more transparent and accountable because all transactions are recorded on a public or private ledger accessible to everyone (KPMG, 2018). These developments demonstrate how blockchain technology could revolutionize auditing and accounting, leading to a more reliable, efficient, and safe financial system.

Blockchain technology is fundamentally reshaping accounting and auditing fields, and one of its key impacts is reducing the need for intermediaries. Traditionally, accounting relies on centralized ledgers maintained by trusted parties, prone to errors and fraud (Schmitz & Leoni, 2019). Blockchain changes this by introducing a decentralized, immutable ledger that records transactions tamper-proof, ensuring data integrity and reducing the need for intermediaries (Dai & Vasarhelyi, 2017). Smart contracts, a crucial feature of blockchain, automate and enforce contract terms, reducing human intervention and associated errors (Rozario & Thomas, 2019). In the auditing realm, blockchain enables real-time verification of transactions, facilitating continuous auditing and reducing the time and costs involved (Cai, 2021). By providing an immutable record of all transactions, blockchain enhances traceability and accountability, making detecting and preventing fraudulent activities easier. The transparency afforded by blockchain ensures that all parties have access to the same data, promoting trust and collaboration (Dai & Vasarhelyi, 2017). In summary, blockchain is not just a technological innovation; it's a cost-saving one, catalyzing a paradigm shift in accounting and auditing and promoting increased efficiency, accuracy, and reliability in financial reporting and oversight (Cai, 2021; Dai & Vasarhelyi, 2017; Rozario & Thomas, 2019; Schmitz & Leoni, 2019; Sabuj et al.,2019).

Despite having its roots in cryptocurrency technology (Nakamoto, 2008), blockchain technology has grown beyond encompassing only digital money (Abreu et al., 2018; Swan, 2015). The digital cryptocurrency phase, which includes digital payment systems, is called blockchain 1.0 (Potekhina & Riumkin, 2017; Brukhanskyi & Spilnyk, 2019). The concept of digital finance came from Blockchain 2.0 applications, which include the intelligent contract-based transfer of non-cash assets, including stocks, bonds, loans, and mortgages (Abreu et al., 2018; Christidis & Devetsikiotis, 2016). Blockchain 3.0 applies blockchain technology beyond business transactions, including government, health, science, and arts and culture (Engelhardt, 2017; Hyvärinen et al., 2017; Kim & Laskowski, 2018; O'Dair & Beaven, 2017). Among other

Vol. 8, No.07; 2024

ISSN: 2456-7760

domains linked to business transactions, blockchain 2.0 has drawn interest in the sectors of finance, accounting, and auditing (Turker & Bicer, 2020; Abreu et al., 2018; AIS, 2018).

According to Alkafaji et al. (2023), blockchain technology occupies the second position, preceded by the internet only. Blockchain has much potential in information processing that might be promising in developing new environments for better accounting information management (Dai & Vasarhelyi, 2017; Kokina et al., 2017; Ahammed & Sabuj, 2018). Researchers' interests in blockchain, auditing, and accounting cover several themes that investigate the potential impact of blockchain technology on accounting and auditing procedures. Blockchain has the potential to provide improved accounting information to users by presenting it in a trustworthy and timely way (Byström, 2019). An analysis of the potential of automating transactions, timeliness, and trustworthiness will likely reveal a clear picture of this transformation. Aslam et al. (2021) note that blockchain technology is being enhanced. An analysis of research trends is likely to identify potential barriers to adopting blockchain in accounting and auditing systems. Furthermore, the researchers must find common pitfalls and suggest best practices. Finally, a bibliometric analysis in this area is expected to discover some development themes that could be crucial for fully integrating blockchain technology in accounting and auditing. Different countries' and authors' contributions are also expected to provide their dominance in this respect. Hence, this study is expected to elucidate the consequences of blockchain technology in accounting and auditing.

2. Methodology

Bibliometric analysis is a way to measure and study scholarly literature, such as publications, citations, authors, journals, and institutions (Mourao & Martinho, 2020). This method involves collecting and analyzing bibliographical data to find patterns and connections in a specific field. The analysis helps to advance scientific knowledge, promote collaboration, and guide future research (Bhuiyan et al., 2024; Islam et al.,2024). For our review, we searched the Scopus database for historical scholarly articles on the impact of blockchain in accounting and auditing. This database is known for its reliability in this field. We followed the PRISMA guidelines to review the literature. The process included five steps: defining research questions, choosing search databases and keywords, evaluating relevant documents, analyzing bibliometric data, and systematically reviewing the results. (Donthu et al., 2021; Saha et al., 2024).

The research starts with relevant questions: What are the significant academic research interests, trends, central research theme, trending keywords, and critical geographical collaborations regarding blockchain in accounting and auditing? What are the future research implications? In our study on the relationship between blockchain technology and accounting and auditing, we started by searching the Scopus database using specific keywords: "Blockchain," "Accounting," and "Auditing or Audit." on May 03, 2024. The initial search resulted in 964 documents. We then narrowed our search to focus on subject areas in business and economics, and we only included documents in English. After applying our inclusion and exclusion criteria, we had 409 documents for further analysis. We carefully reviewed each document's titles, abstracts, keywords, and conclusions and selected 285 papers that aligned with the theme of our research. These 285 papers underwent a thorough full-text screening where we evaluated each paper of

Vol. 8, No.07; 2024

ISSN: 2456-7760

scope, relevance, and context, and we eventually finalized 95 documents suitable for our final bibliometric analysis. We used the VOSviewer and Biblioshiny R packages to conduct our bibliographic review.

The summary statistics of the bibliometrics analysis in 95 articles show that we have 280 authors, 57 sources, 454 keywords, and 84 collaborative outputs. These documents also show that the annual production growth rate is 79.10%, and the average number of citations per document is 18.21. The international co-authorship is 23.16, and the number of co-authors per document is 3.06.

3. Bibliometric Analysis

3.1 Publication Overtime

Blockchain is a unique concept that has recently caught the interest of accounting and auditing researchers. (Lardo et al., 2022). Figure 1 shows an insignificant number of papers published between 2017 and 2020. However, there was a dramatic increase in publications over the three consecutive years from 2021, nearly threefold. More than 80% of the papers in our dataset are concentrated between 2021 and 2023, and 2023 was the most productive year with 33 publications. This trend indicates that blockchain in accounting and auditing is becoming a popular area in the business field.

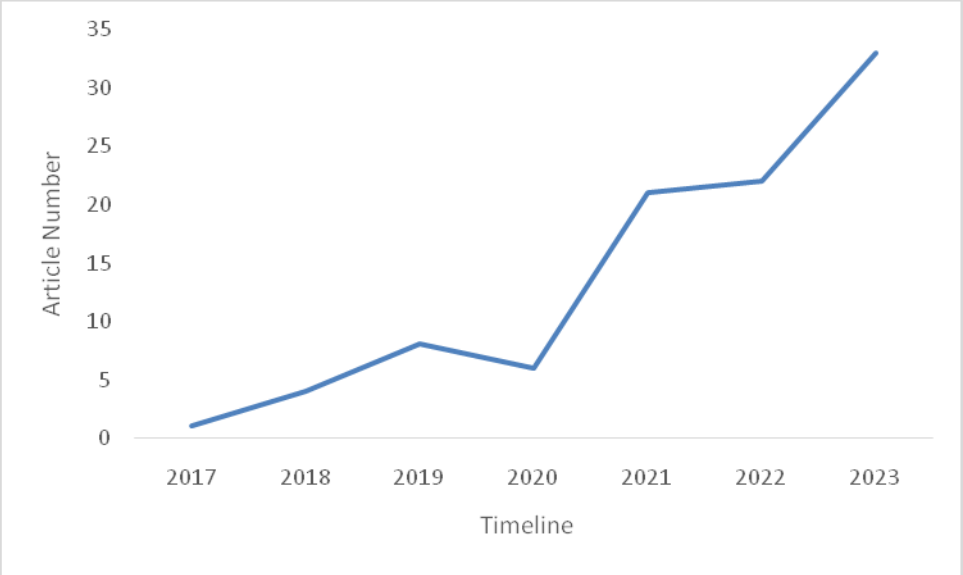

Figure 1: Publication over time

3.2 Most Cited Publications

Table 1 displays the top ten most cited publications on blockchain in accounting and auditing, including the authors' names, titles, journal names, and publication years. The document's significance in a particular field of study may be understood by looking at the number of citations because citation analysis is the best method for assessing research since it measures the influence of a set of publications authored by a university or an individual (Podsakoff et al.,

Vol. 8, No.07; 2024

ISSN: 2456-7760

2008; Baier-Fuentes et al., 2019). We found that the Moll J.; Yigitbasioglu O. (2019) article "The role of internet-related technologies in shaping the work of accountants: New directions for accounting research," published in British Accounting Review with 235 citations, is the most influential article, followed by the Kshetri N. (2021) article "Blockchain and sustainable supply chain management in developing countries ", published in International Journal of Information Management with 123 citations, which is the second most popular journal. With 98 citations, Albitar K., Gerged A.M., Kikhia H.; Hussainey K. (2021), "Auditing in times of social distancing: the effect of COVID-19 on auditing quality," published in International Journal of Accounting and Information Management is the 3rd most cited journal in the world on blockchain. The table shows that most of the cited papers were published in 2021.

Table 1: Most cited publications

Authors	Title	Year	Source Title	Total Citation
Moll, Jodie; Yigitbasioglu, Ogan	The role of internet-related technologies in shaping the work of accountants: New directions for accounting research	2019	British Accounting Review	235
Kshetri, Nir	Blockchain and sustainable supply chain management in developing countries	2021	International Journal of Information Management	123
Albitar, Khaldoon; Gerged, Ali Meftah; Kikhia, Hassan; Hussainey, Khaled	Auditing in times of social distancing: the effect of COVID-19 on auditing quality	2021	International Journal of Accounting and Information Management	98
Han, Hongdan ; Shiwakoti, Radha K. ; Jarvis, Robin ; Mordi, Chima ; Botchie, David	Accounting and auditing with blockchain technology and artificial Intelligence: A literature review	2023	International Journal of Accounting Information Systems	89
Rozario, Andrea M.; Vasarhelyi, Miklos A.	Auditing with smart contracts	2018	International Journal of Digital Accounting Research	87
Secinaro, Silvana; Dal Mas, Francesca; Brescia, Valerio); Calandra, Davide	Blockchain in the accounting, auditing and accountability fields: a bibliometric and coding analysis	2021	Accounting, Auditing and Accountability Journal	63
Sheldon, Mark D.	A primer for information technology general control	2019	Current Issues in Auditing	61

Vol. 8, No.07; 2024

ISSN: 2456-7760

	considerations on a private and permissioned blockchain audit			
Rijanto, Arief	Blockchain technology adoption in supply chain finance	2021	Journal of Theoretical and Applied Electronic Commerce Research	61
Adams, Richard; Parry, Glenn; Godsiff, Phil; Ward, Peter	The future of money and further applications of the blockchain	2017	Strategic Change	60
Bonyuet, Derrick	Overview and impact of blockchain on auditing	2020	International Journal of Digital Accounting Research	48

3.3 University Affiliation:

The university affiliation regarding the number of papers published on blockchain research is listed in Figure 3. Some research concentrates on university publications since they indicate an author's or university's output (Trieschmann et al., 2000; Saha et al., 2024). The Amman Arab University in Jordan publishes papers and is the most productive university. The University of Thessaly in Greece is the second most productive university, publishing seven papers. The Brunel University London in England, Central Ukrainian National Technical University in Ukraine, City University of New York in the USA, Khalifa University of Science and Technology, United Arab Emirates, and West Ukrainian National University in Ukraine each published 5 research papers. The other 3 universities from the top ten research institutes published 4 papers. Macquarie University in Australia published 5 papers. Two of the top ten research institutions are from Ukraine, two are from Italy, and the rest are from the United States, United Arab Emirates, England, Greece, and Spain.

Vol. 8, No.07; 2024

ISSN: 2456-7760

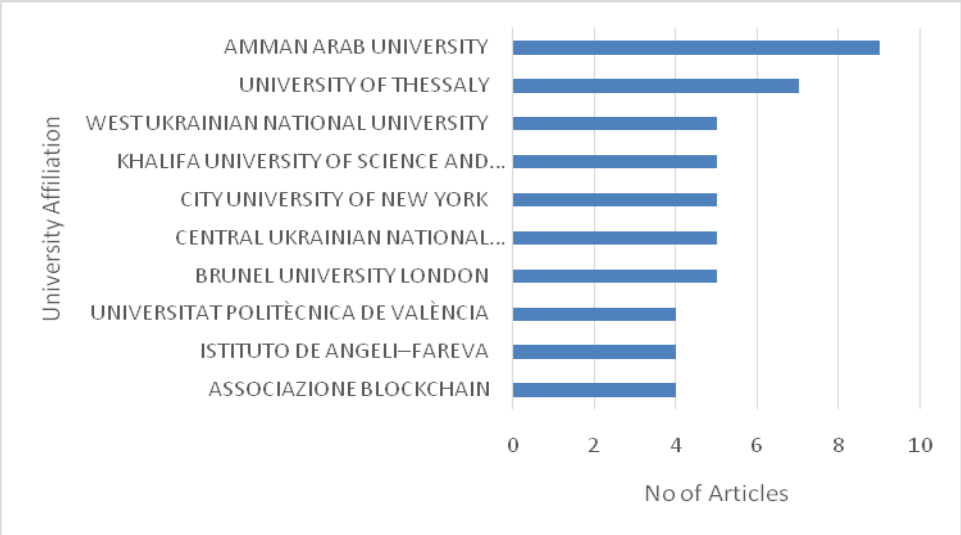

Figure 3: University Affiliation

3.4 Country Publications and Citations

Table 2 highlights the top contributing countries regarding total citations and the number of articles published on a specific research topic. The United Kingdom leads with a significant total of 536 citations across 8 articles. Studying the countries researching specific topics gives us an understanding of global research trends and where expertise is located worldwide (Lewis & Cockburn-Wootten, 2020). Italy and the USA have 123 citations, with Italy producing 5 articles and the USA 7 articles. Spain follows with 68 citations from 7 articles. Indonesia has made notable contributions with 61 citations from a single article, while Ireland has a substantial impact with 45 citations from one article. The United Arab Emirates has garnered 43 citations across 3 articles. Jordan, with 4 articles, has accumulated 40 citations. The Czech Republic has contributed one highly cited article with 35 citations. Lastly, Australia has 33 citations from 3 articles. These statistics indicate these countries' substantial contributions and impact in the research field.

Table 2: Country Publications and Citations

Country	Total Citations	No of Articles
United Kingdom	536	8
Italy	123	5
USA	123	7
Spain	68	7
Indonesia	61	1
Ireland	45	1
United Arab Emirates	43	3
Jordan	40	4
Czech Republic	35	1
Australia	33	3

Vol. 8, No.07; 2024

ISSN: 2456-7760

3.5 Countries' Collaboration

Figure 4 presents the country's collaboration network based on research publications. The collaboration map details partnerships between different countries, with the frequency of collaborations indicated by the number of joint papers produced. The most frequent collaborations are observed between Ukraine and Kazakhstan, the United Kingdom and Italy, and the United Kingdom and Sweden, each with 2 joint papers (Schmitz & Leoni, 2019). Australia with Bangladesh and South Africa, Austria with Belgium and Norway, Denmark with Belgium, Israel, and Norway produced 1 joint paper.

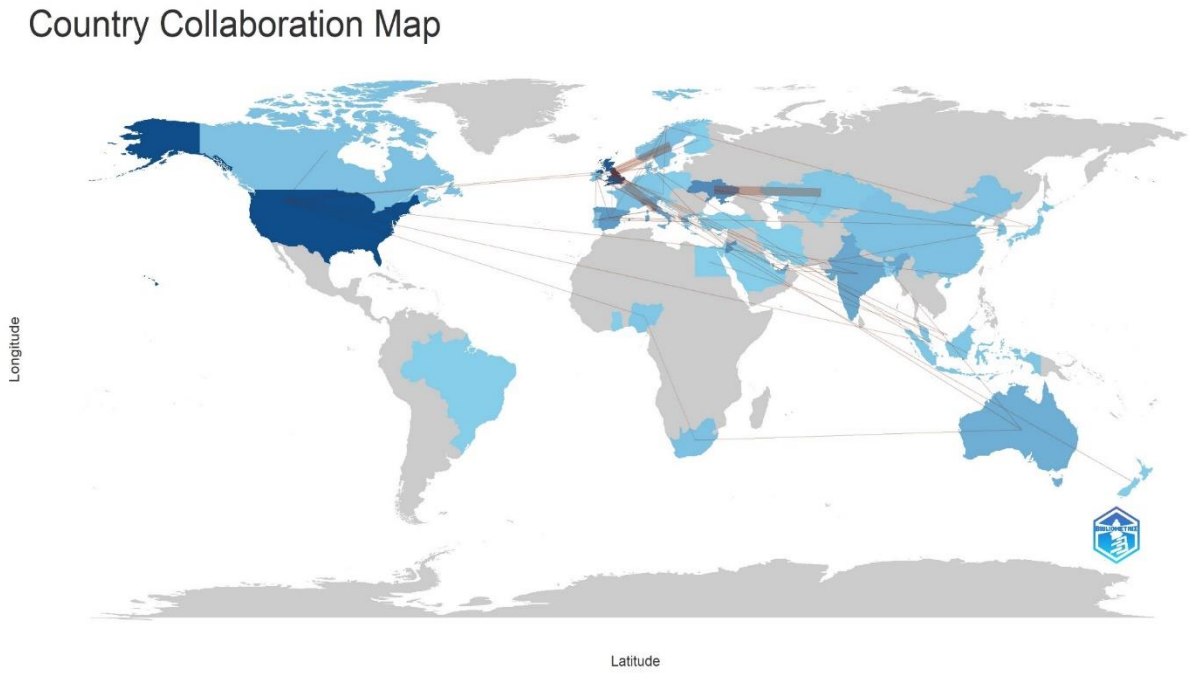

Figure 4: Country Collaboration Map

3.6 Articles sources

Table 3 shows a detailed snapshot of journals contributing to digital accounting research, featuring essential metrics such as the h-index, g-index, total citations (TC), number of papers (NP), and the inception year (PY_start) of each journal. The credibility, subject relevance, and adherence to ethical standards of an article are heavily influenced by its source (Saha et al., 2024). International Journal of Digital Accounting Research is at the forefront, exhibiting a commanding h-index of 6 and a robust g-index of 12, indicative of its profound impact and prolific publication output since its inception in 2018. This journal has amassed a total citation count of 219 across 12 papers, underscoring its influence in the field. The Accounting, Auditing, and Accountability Journal follows closely, boasting an h-index and g-index of 5, indicating its emergence as a noteworthy contributor since 2021, with 128 citations distributed over 5 publications.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Table 3: Article sources

Element	h_index	g_index	TC	NP	PY_start
International Journal of Digital Accounting Research	6	12	219	12	2018
Accounting, Auditing and Accountability Journal	5	5	128	5	2021
Financial And Credit Activity: Problems of Theory and Practice	3	3	13	7	2022
Journal of Theoretical and Applied Electronic Commerce Research	3	3	82	3	2021
Big Data and Cognitive Computing	2	2	21	2	2019
Current Issues in Auditing	2	3	95	3	2018
International Journal of Accounting Information Systems	2	2	115	2	2020
International Journal of Information Management Data Insights	2	2	47	2	2022
Issues In Information Systems	2	2	10	2	2019
Uncertain Supply Chain Management	2	2	39	2	2022

3.7 Authors' Articles and Citations

Table 4 provides insights into the top authors in the field, detailing their publication records, total citations, average citations per publication, h-indexes, and affiliations. Among these authors, Smith SS, Sheldon MD, and several others exhibit a notable h-index of 3, reflecting their scholarly impact. Sheldon MD stands out with a commendable total citation count of 95, distributed across 3 publications, indicating significant recognition within the academic community. Al-Zaqeba MAA, Almatarneh Z, Ineizeh NI, Jarah BAF, and Fomina T contribute with consistent h and g-indices of 2, showcasing their steady presence in the research landscape. Notably, Al-Zaqeba MAA, Almatarneh Z, and Ineizeh NI share an identical citation count of 39, indicating their comparable impact. Meanwhile, authors like Abbasi M, Adams R, and Adekoya AF exhibit more modest citation counts, each with a single publication and corresponding citations ranging from 2 to 60. Adams R's paper from 2017 marks the earliest contribution in the list, reflecting the longevity of their research impact (Adam et al., 2017). The distribution of publication years among these authors illustrates the evolving nature of research in the field, with varying starting points ranging from 2017 to 2022.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Table 4: Authors' Articles and Citations

Element	h_index	g_index	TC	NP	PY_start
Smith Ss	3	3	33	3	2018
Al-Zaqeba Maa	2	2	39	2	2022
Almatarneh Z	2	2	39	2	2022
Fomina T	2	2	5	2	2023
Ineizeh Ni	2	2	39	2	2022
Jarah Baf	2	2	39	2	2022
Sheldon Md	2	3	95	3	2018
Abbasi M	1	1	2	1	2023
Adams R	1	1	60	1	2017
Adekoya Af	1	1	31	1	2022

3.8 Keyword Occurrence

Figure 5 depicts the distribution of keywords concerning blockchain technology in accounting and auditing. As expected, "blockchain" emerges as the dominant keyword, with a frequency of 65 occurrences. This represents a significant share of 46% of all keywords identified in the research. "Accounting" and "Auditing" frequency occurrences are 14 (10%) and 11(8%) times, respectively. Following closely behind is the term "blockchain technology," appearing 10 times, translating to 7% of the total keywords. This suggests that while blockchain technology is the primary focus of the research, the specific application of smart contracts may be a less explored

area within the analysed dataset (Dai & Vasarhelyi, 2017; Schmitz & Leoni, 2019).

Figure 5: Keyword Occurrence

Vol. 8, No.07; 2024

ISSN: 2456-7760

3.9 keyword trend

The trend topics chart illustrates the evolution of keyword frequencies within research during the 2020-2023 period in Figure 6. In the initial year of 2020, keywords such as "smart contracts," "audit," and "bitcoin" dominated the relevant scholarly landscape, exhibiting similar moderate frequencies. The term "accounting" maintained a consistent presence across all three years, indicating its sustained relevance. From 2021 to 2023, the keyword "blockchain" emerged as a focal point, signifying a growing interest in the core blockchain concept and principles. Furthermore, the analysis unveils that the keywords "blockchain technology," "auditing," and "big data" have been areas of significant exploration from 2022 to 2023. Among these, "blockchain technology" witnessed a substantial surge in frequency in 2023, depicted by the lightest shade, surpassing the other terms" big data" and suggesting a heightened research emphasis (Cai, 2021). Concurrently, "accounting" and "auditing" exhibited moderate frequencies, indicating their enduring importance within the domain. The integration of blockchain and big data technologies has also been an enduring area of investigation, as evidenced by the sustained moderate frequency of the respective keywords throughout the analysed period. The integration of blockchain and big data technologies has also been an enduring area of investigation, as evidenced by the sustained moderate frequency of the respective keywords throughout the analyzed period (Kamilaris et al., 2019).

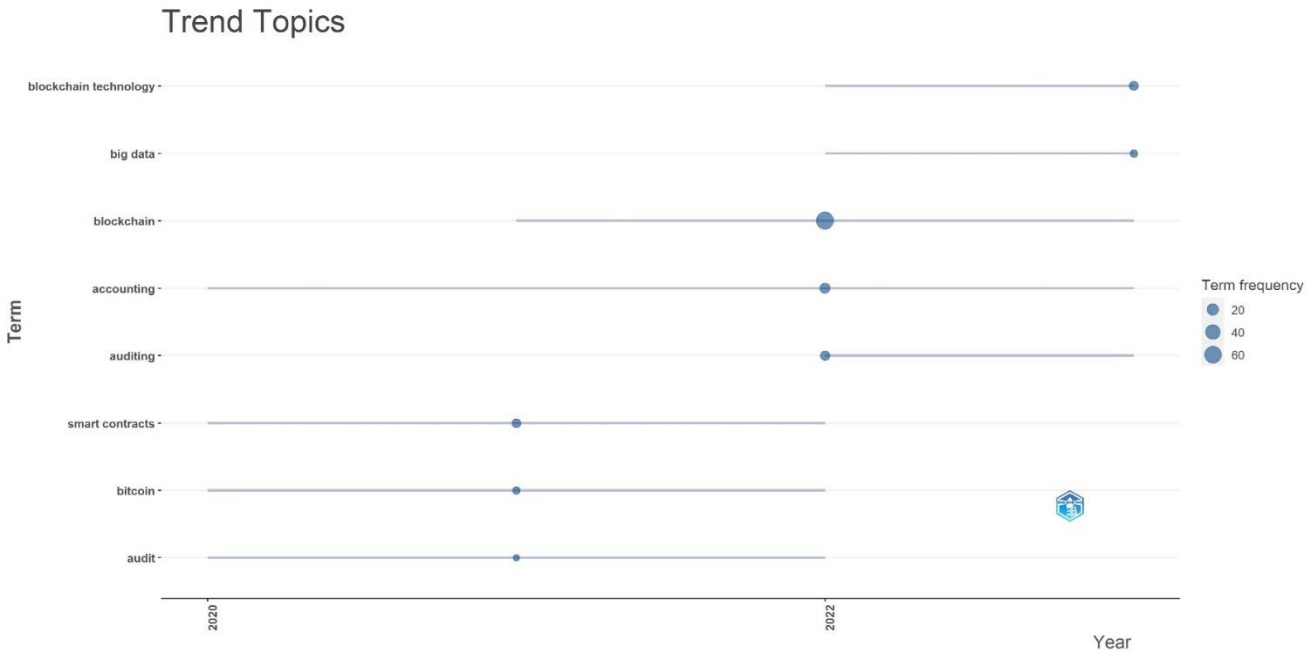

Figure 6: Keyword Trend

3.10 keywords Co-occurrence

Figure 7 visualizes keyword co-occurrence in blockchain applications in accounting and auditing research generated using VOS viewer. The graph is divided into three clusters, each coloured differently to indicate thematic groupings within the research field.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Cluster Red: Integration with Emerging Technologies

Cluster red highlights the synergy between blockchain and emerging technologies like Artificial Intelligence (AI), big data, and the Internet of Things (IoT). This convergence facilitates advancements within the accounting field, particularly in auditing and transparency. Furthermore, the fusion of blockchain with IoT enables improved tracking and authentication of products throughout their lifecycle. This enhances transparency, fuels innovation, and bolsters digitalization efforts (Zhou et al., 2020).

Cluster Green: Core Blockchain Technologies

This section dives deeper into the core components of blockchain technology, highlighted in cluster green. These fundamentals include well-known cryptocurrencies like Bitcoin and Ethereum, alongside foundational concepts such as smart contracts and a specific accounting method called triple-entry accounting (Nakamoto, 2008). Meanwhile, smart contracts automate the execution and enforcement of agreements without requiring any third-party involvement. For example, Ethereum's smart contract functionality enables decentralized application development and operation. Tied up with blockchain technology, triple-entry accounting offers a more transparent and secure approach to financial reporting, ultimately reducing the risk of fraud and errors.

Cluster Blue: Blockchain in Supply Chain and Sustainability

Cluster Blue explores blockchain's application in supply chain management and sustainability, emphasizing improvements in transparency and efficiency. Blockchain enables tracking products from origin to consumer, ensuring authenticity and reducing fraud. The technology's immutable records support sustainable practices by verifying ethical sourcing and reducing carbon footprints, thus contributing to environmental sustainability (Kamilaris et al., 2019).

Vol. 8, No.07; 2024

ISSN: 2456-7760

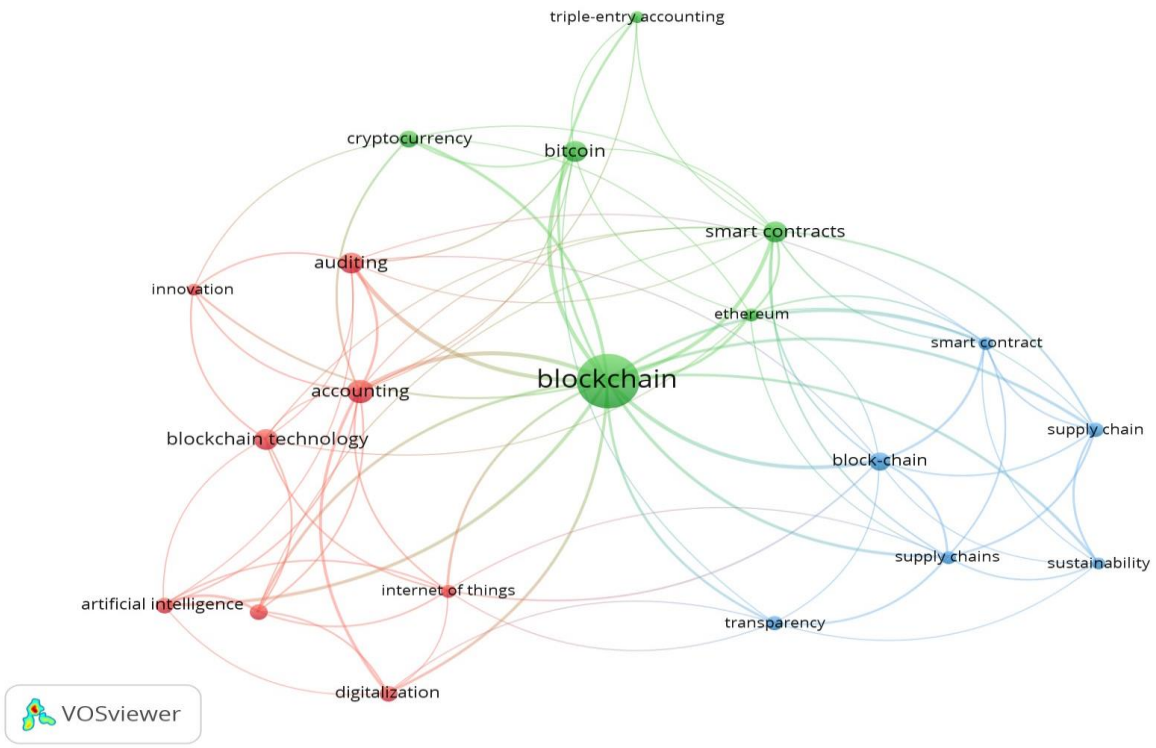

Figure 7: Keywords Co-occurrence

3.11 Thematic map

Figure 8 depicts the thematic map that identifies the four themes with different importance from different angles. It presents the dynamics and development of research areas using the strategic network extracted from keyword analysis (Rejeb et al., 2022). The four quadrants are plotted by their density and centrality. The centrality (x-axis) captures the level of interaction among networks (Agbo et al., 2021). It signifies the importance of the research, which is blockchain, accounting, and auditing in our case, and density (y-axis) measures the level of development. Cobo et al. (2011) state that the themes have been categorized into four sectors: motor themes, niche themes, emerging or declining themes, and basic themes.

Motor themes: Motor themes are presented in the first quadrant. These themes are highly important and well-developed in the research area. The figure shows that supply chain and artificial intelligence are the only two keywords in these quadrants. These two are highly relevant and well-developed.

Niche themes: Niche themes represent low relevance but highly developed themes. The figure shows that the journal's specialized and well-developed research areas are distributed ledger, the accounting profession, and financial reporting.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Emerging or declining themes: This quadrant is characterized by low centrality and density. It shows that privacy and digital technology are the two themes with low importance and attention. Another noticeable feature is that the digital technology theme is moving towards high centrality.

Basic themes: Basic themes are presented in the fourth quadrant, which is characterized by higher relevance but is poorly developed. Our study finds that blockchain studies are highly relevant but not well-developed. The themes that are very important and deserve attention are cryptocurrency and blockchain. Hence, future studies should include these themes, as they have much potential in this research area.

Our overall analysis of thematic maps shows that there is scope for research on important themes in blockchain and accounting. Future research on niche themes might yield fruitful outcomes. Again, special focus should be given to blockchain and cryptocurrency, as these are very promising areas in this research category.

Figure 9: Thematic map

3.12 Three field plots

Figure 10 is a three-plot map to identify the authors' specialized area. This analysis links the authors' keywords in blockchain research in accounting and auditing with countries and journals. This shows the country name on the left, the names of journals in the middle, and the keywords on the right. From the graph, blockchain occupies the dominant research area (Riehmann et al., 2005). Most blockchain research is published in two papers, *Financial and Credit Activity Problems of Theory and Practice and the International Journal of Digital Accounting Research*. Of these two journals, the former is the more popular, mainly concentrated by Ukrainian publications, and the latter is by the USA. Auditing and accounting are the second most popular keywords in this research area. Again, research on these two popular keywords is resourced in the top two journals. One noticeable finding is that accounting and auditing follow blockchain

Vol. 8, No.07; 2024

ISSN: 2456-7760

regarding their occurrences. Bitcoin and blockchain technology are also very popular among researchers and ranked almost equally. *The International Journal of Digital Accounting Research* and Accounting, Auditing, and Accountability are the significant sources of publications for the papers with these keywords. Regarding the contribution of the top countries, the most popular is Ukraine, which the USA follows. Australia, Italy, and Portugal occupy almost equal territory regarding their contributions, and each is concentrated in one journal only. Their diversification in various journals is non-existent. The contribution of India, Jordan, Greece, Spain, the UAE, and the UK is very low in this respect.

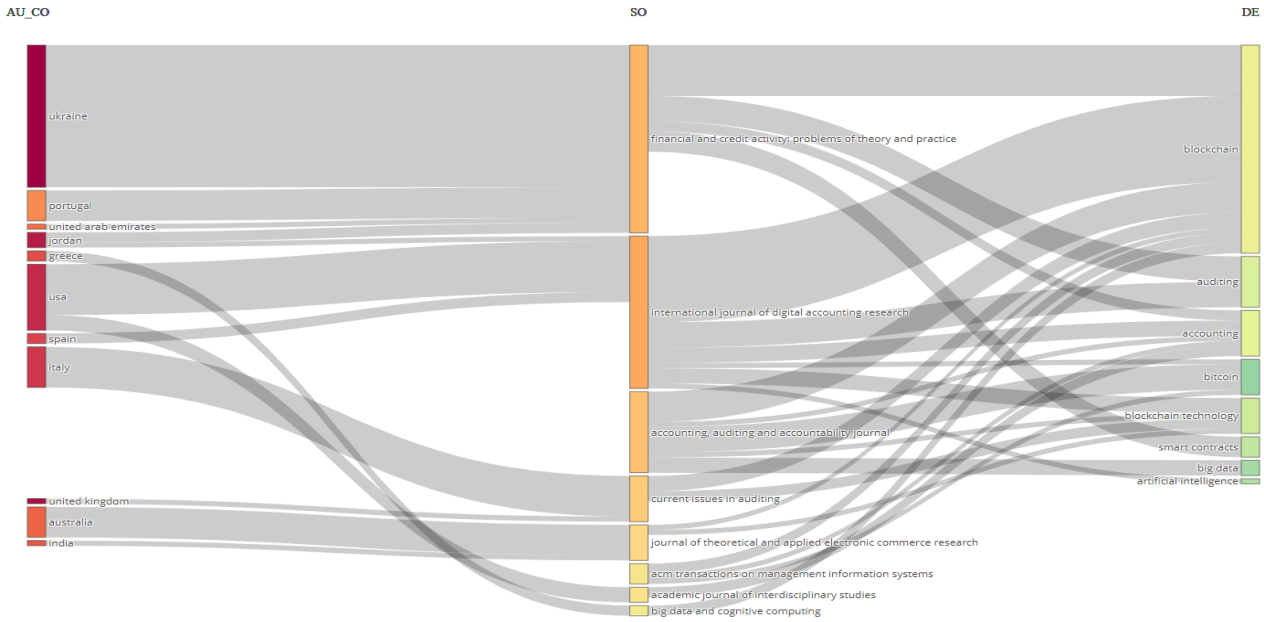

Figure 10: Three field plots

4. Future Research Direction

The study thoroughly reviews the literature on blockchain applications in accounting and auditing in bibliometric coupling (Figure 11) to develop three key policy implications discussed below that are important for addressing the policy, challenges, and future research questions

Vol. 8, No.07; 2024

ISSN: 2456-7760

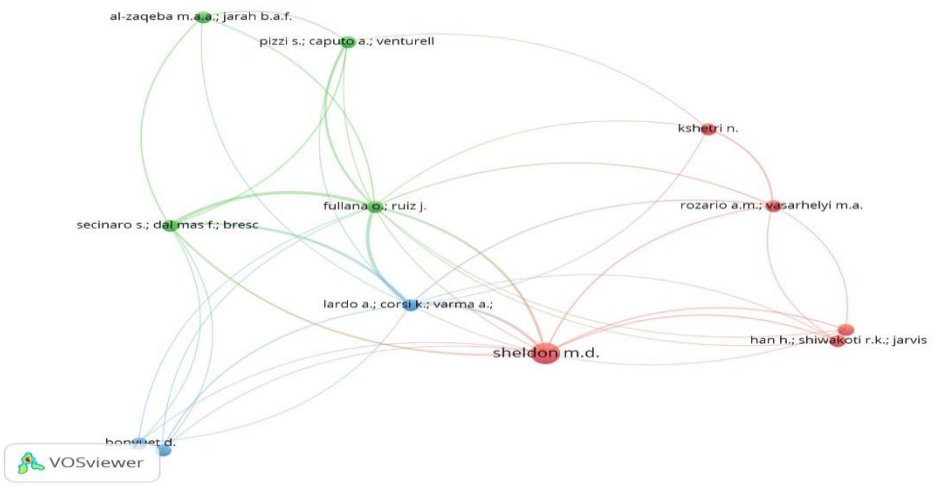

Figure 11: Bibliometric Coupling

4.1 Policy Implications

Standards, Governance, and Regulatory Compliance for Blockchain Technology:

As multiple consortium members from different jurisdictions are involved in blockchain technology, it is evident that there are challenges related to governance, framework, standards, and regulatory compliance. Rozario et al. (2018) pointed out that the current regulatory frameworks are insufficient to manage real-time accounting transactions and audit reporting. Lardo et al. (2022) highlighted that current practices need to be revised to handle the unique characteristics of crypto assets. Hence, to ensure adequate information technology general control (ITGC) during blockchain-based accounting transactions and auditing, new regulations, integrated local and regional governance, general data protection regulation, and intelligent contracts/audit procedures can be leveraged.

Blockchain Technology Transformation and Security

Despite being a new technology, blockchain faces significant challenges in transformation and security; however, it holds tremendous potential for enhancing operational efficiency and transparency in the accounting domain. Additionally, security concerns such as the risk of 51% cyber-attacks, creating fraudulent transactions accepted as valid by most nodes, and vulnerabilities in intelligent contracts pose substantial risks to the transformation of blockchain networks (Bonyuet,2020). Fullanaet al. (2021) also heightened similar challenges of blockchain technology transformation associated with confidentiality and data security in decentralized and distributed ledger, handling high volume of accounting transactions efficiently, and the need for advanced technologies in poor counties. Future advancements in blockchain technology should focus on improving scalability through innovative consensus algorithms, sharding techniques, utilizing new AI and ML techniques, and re-designing permission blockchain networks. Furthermore, Secinaro et al. (2021) suggested leveraging public-private partnerships to improve access to advanced technologies and infrastructure and integrating multi-layer solutions, for example, off-chain processing, triple entry accounting software (e.g., Balance and Triple Entry) with blockchain for boosting efficiency.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Adoption, Integration, and Economic Value of Blockchain Technology

The lack of standards integration among various blockchain nods (participants) has made it more difficult for blockchain technology to be easily incorporated into current systems, which hampers its adoption and integration, as mentioned by Lardo et al. (2022). Whereas Pizzi et al. (2022) highlighted accounting and auditing professionals' lack of awareness and comprehension of blockchain technology adoption and inherent resistance to adopting new technologies in traditional accounting and auditing practices. Also, the economic value of blockchain is often questioned due to high implementation costs and uncertain return on investment. To overcome these challenges, developing universal standards, stakeholder engagement and participatory approaches, collaborative learning opportunities for new technology, and enabling smoother integration with legacy systems. Additionally, Procházka (2018) suggested that the development of hybrid audit/accounting models - combines blockchain-based ingenious procedures with traditional methods and utilization of different data storage solutions IPFS, BigchainDB, and Cloud Computing with blockchain systems to achieve faster accounting transaction processing times and blockchain adoption in AIS.

Cluster	Challenges	Future Research Questions (PRQ)
Standards, Governance, and Regulatory Compliance for Blockchain Technology	1. Ineffective audit governance frameworks for blockchain networks, especially in permission and consortium blockchains.	PRQ1: How integrated (local and regional) governance models influence the performance and stakeholder engagement in permissioned and consortium blockchains?
	2. Insufficient regulatory structures to support blockchain-enabled real-time transactional audit reporting rather than traditional yearly qualitative audit opinions.	PRQ2: How can regulatory improvement related to ingenious audit procedures and smart contracts mitigate the challenges and risks linked to blockchain-enabled real-time audit systems?
	3. The lack of favourable legislation in many countries, including conflicts with regulations like the GDPR in Europe, poses significant challenges to blockchain in accounting.	PRQ3: What legislative changes are necessary with the General Data Protection Regulation (GDPR) to harmonize blockchain implementation in accounting across different jurisdictions?
	4. The current accounting standards (IFRS) are not well-equipped to evaluate and manage crypto assets effectively.	PRQ4: How can regulatory bodies and standard-setting organizations collaborate to create practical accounting standards for crypto assets, and what are the potential impacts of new accounting standards?
	5. Complexity in governance due to the involvement of multiple consortium members.	PRQ5: Can governance difficulties in blockchain consortia with multiple participants be managed with new technological solutions like AI and machine learning?

Blockchain Technology Transformation and Security	6. Failure to maintain confidentiality and security of data in decentralized and distributed ledger.	PRQ6: What are the ethical considerations related to data confidentiality and security need to be considered while re-designing permission blockchain networks in accounting and auditing applications?
	7. Limited control over data transmission from upstream systems, legacy systems, ERPs, and third-party systems to blockchain.	PRQ7: What are the key performance indicators for evaluating the effectiveness of data transmission? How can real-time data synchronization between upstream systems and blockchain networks be achieved without compromising data quality and security?
	8. Advanced technologies and infrastructure are often inaccessible to developing countries.	PRQ8: Leveraging public-private partnerships to improve access to advanced technologies and infrastructure for blockchain implementation in accounting and auditing practices in developing countries.
	9. Robust blockchain architecture and less system flexibility	PRQ9: How can blockchain architectures be designed to balance robustness and flexibility and to support various accounting needs while maintaining the core benefits of blockchain?
	10. Scalability issue: Blockchain technology is struggling to efficiently handle a high volume of accounting transactions.	PRQ10: How can multi-layer solutions, for example, off-chain processing and triple entry accounting software (e.g., Balance and Triple Entry), be efficiently integrated into blockchain-based accounting systems to address scalability issues and handle peak transaction volumes during critical accounting periods?
	11. Ensuring the cybersecurity of blockchain systems in accounting is critical due to its decentralization and complex networking nature.	PRQ11: Anomaly detection through machine learning algorithms and implications of quantum computing can be used to identify and respond to cybersecurity threats in blockchain-based accounting systems.
Adoption, Integration, and Economic Value of Blockchain Technology	12. Risks of non-acceptance and implementation of changes by all consortium members, potentially leading to blockchain threats.	PRQ12: Stakeholder engagement and participatory approaches can effectively mitigate the risks of non-acceptance and implementation of changes by consortium members in multi-jurisdictional blockchain-based accounting systems.

Vol. 8, No.07; 2024

ISSN: 2456-7760

	13. A lack of AIS/Audit practices and operational commonality among all nodes (participants) of the blockchain network.	PRQ13: What roles do international accounting and auditing standards boards, international organizations, and governments play in ensuring standard practices within blockchain networks, and how can these standards be adapted for blockchain technology?
	14. The gap of knowledge and understanding about blockchain technology adoption in AIS among potential users.	PRQ14: Collaborative learning platforms, communities of practice, and continuous learning of new skills/technology can be leveraged to improve blockchain knowledge and understanding among accounting and audit professionals.
	15. Higher cost of new infrastructure implementation and integration of blockchain with existing system.	PRQ15: What long-termcost-benefit and efficiencies can blockchain technology bring, and how can cloud-based blockchain solutions help reduce the infrastructure costs for accounting and auditing applications?
	16. Inherent resistance to adopting new technologies in traditional accounting and auditing practices.	PRQ16: How can hybrid audit/accounting models, which combine blockchain-based ingenious procedures with traditional methods, effectively address the inherent resistance to adopting new technologies in traditional accounting and auditing practices?
	17. Data storage capacity and high processing time	PRQ17: What impact do different data storage solutions, such as IPFS, BigchainDB, and Cloud Computing, have on blockchain systems to achieve faster accounting transaction processing times?

5. Conclusion, Limitation, and Future Study

This study attempts to find research trends of blockchain in the accounting and auditing fields by applying bibliometric analysis. Only a few publications on blockchain in accounting and auditing existed between 2017 and 2020. However, in 2021, there was a significant increase, with the number of publications reaching a high of 33 in 2023, indicating a growing interest in this field. Also, looking at the top ten most cited publications, the article with the highest number of citations (235) was written by Moll and Yigitbasioglu (2019). It is worth noting that most of these highly cited papers were published in 2021. According to the university affiliation, the Amman Arab University in Jordan is considered the most productive university. Regarding international cooperation, the UK ranks first with substantial contributions and modest levels of engagement, while Italy and the UAE have robust alliances. Studies conducted within a country

Vol. 8, No.07; 2024

ISSN: 2456-7760

tend to be more prominent in Jordan and India. The United Kingdom, Italy, and the United States rank highest for citations received. Partnerships between nations such as Kazakhstan and Ukraine are noteworthy. Publications with a strong relevance and effectiveness track record include the International Journal of Digital Accounting Research. The analysis identifies "blockchain" as the dominant keyword, representing 46% of occurrences, with "blockchain technology" and "smart contracts" following. Keyword trends from 2020 to 2023 show a growing focus on blockchain, with notable increases in "blockchain technology" and "auditing." Co-occurrence analysis reveals three clusters: integration with emerging technologies (AI, big data, IoT), core blockchain technologies (cryptocurrencies, smart contracts), and applications in supply chain and sustainability. The thematic map reveals that 'privacy' and 'digital technology' could be focused on as these themes emerge and will only decline with proper attention. Blockchain, blockchain technology, and cryptocurrency are crucial for adequately developing this technology in accounting and auditing research. On the other hand, three field plots reveal that Ukraine and the USA are the top contributors in generating research in this area, though there is a vast difference between the contributions of these two countries. Financial And Credit Activity: Problems of Theory and Practice and the International Journal of Digital Accounting Research are the top sources of publications. Regarding keywords, blockchain is much more popular than the rest, even than auditing and accounting. Analyzing bibliographic clusters focusing on challenges and future directions reveals significant challenges in adopting blockchain technology within accounting and auditing, particularly in governance, regulatory compliance, security, and integration, which have been highlighted. Addressing these issues requires integrated governance models, re-designed regulatory frameworks, and technological advancements like AI (ML Rozario et al., 2018; Lardo et al., 2022, *Bhuiyan& Mazumder, 2024*). Developing hybrid models that combine blockchain with traditional methods can overcome resistance and facilitate smoother integration (Bonyuet, 2020). Future research should focus on creating scalable, robust blockchain architectures and universal standards to ensure seamless adoption and maximize the economic benefits of blockchain in accounting systems

While helpful in mapping academic landscapes and identifying influential works, our bibliometric analysis of blockchain's impact on accounting and auditing has limitations. For instance, it mainly focuses on articles in the Scopus database, potentially overlooking valuable insights from the Web of Science and other sources. Additionally, our paper covers a broad overview of blockchain's impact on accounting and auditing fields. However, the application of accounting and auditing is multifaceted, limiting its relevance in any field in real-world contexts. Moreover, the fast-paced advancements in blockchain can quickly reduce accounting and auditing research more transitory. Future studies should consider integrating emerging specific cases of blockchain technologies, such as Bitcoin, with a specific branch of accounting and track the interdisciplinary connection of blockchain in the accounting and auditing fields.

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Vol. 8, No.07; 2024

ISSN: 2456-7760

Reference:

Abu Huson, Y., Sierra-García, L., & Garcia-Benau, M. A. (2024). A bibliometric review of information technology, artificial intelligence, and blockchain on auditing. *Total Quality Management & Business Excellence*, *35*(1-2), 91-113.

Adams, R., Parry, G., Godsiff, P., & Ward, P. (2017). The future of money and further applications of the blockchain. *Strategic Change*, *26*(5), 417-422.

Agbo, F. J., Oyelere, S. S., Suhonen, J., & Tukiainen, M. (2021). Scientific production and thematic breakthroughs in smart learning environments: a bibliometric analysis. *Smart Learning Environments*, *8*, 1-25.

Ahammed, A., & Sabuj,S.(2018). Firm-specific Financial Determinants of Non-Performing Loan in the Banking Sector of Developing Countries: Evidence from the Listed Commercial Banks in Bangladesh. *Journal of Economics and Business, Vol.1, No.4*, 555-563. https://doi.org/10.31014/aior.1992.01.04.49

AIS, D. (2018). Firm-specific Financial Determinants of Non-Performing Loan in the Banking Sector of Developing Countries: Evidence from the Listed Commercial Banks in Bangladesh. *Journal of Economics and Business*, *1*(4), 555–563.

Ajayi-Nifise, A. O., Falaiye, T., Olubusola, O., Daraojimba, A. I., & Mhlongo, N. Z. (2024). Blockchain in US accounting: a review: assessing its transformative potential for enhancing transparency and integrity. *Finance & Accounting Research Journal*, *6*(2), 159-182.

Albitar, K., Gerged, A. M., Kikhia, H., & Hussainey, K. (2020). Auditing in times of social distancing: the effect of COVID-19 on auditing quality. *International Journal of Accounting & Information Management*, *29*(1), 169-178.

Al-Zaqeba, M., Jarah, B., Ineizeh, N., Almatarneh, Z., & Jarrah, M. A. A. L. (2022). The effect of management accounting and blockchain technology characteristics on supply chains efficiency. *Uncertain Supply Chain Management*, *10*(3), 973-982.

Baier-Fuentes, H., Merigó, J. M., Amorós, J. E., & Gaviria-Marín, M. (2019). International entrepreneurship: a bibliometric overview. *International Entrepreneurship and Management Journal*, *15*, 385-429.

Bhuiyan, J., & Mazumder, R. (2024). Application of linear programming in employee allocation: A case study in emerging economy. *International Journal of Science and Research Archive*, *11*(01), 253-259.

Bhuiyan, J., Mazumder, R., Afrose, S., & Hasan, M. (2024). Industry-4, Big Data, and Blockchain Research Prospects in Supply Chain Domain: A Bibliometric Review. *Business Perspective Review*, *6*(1).

Bonyuet, D. (2020). Overview and impact of blockchain on auditing. *International Journal of Digital Accounting Research*, *20*, 31-43.

Cai, C. W. (2021). Disruption of financial intermediation by blockchain: A review on cryptocurrency and initial coin offering. *Technological Forecasting and Social Change*, *162*, 120396.

Chowdhury, E., Stasi, A., & Pellegrino, A. (2023). Blockchain technology in financial accounting: emerging regulatory issues. *Review of Financial Economics*, *21*, 862-868.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the Fuzzy Sets Theory field. *Journal of informetrics*, *5*(1), 146-166.

Dai, J., & Vasarhelyi, M. A. (2017). Toward Blockchain-Based Accounting and Assurance. *Journal of Information Systems*, 31(3), 5-21.

EY. (2020). How blockchain is revolutionizing finance and accounting. *EY*. Retrieved from https://www.ey.com/en_gl/blockchain/how-blockchain-is-revolutionizing-finance-and-accounting

Fullana, O., & Ruiz, J. (2021). Accounting information systems in the blockchain era. *International Journal of Intellectual Property Management*, *11*(1), 63-80.

Islam, J., Saha, S., Hasan, M., Mahmud, A., & Jannat, M. (2024, April). Cognitive Modelling of Bankruptcy Risk: A Comparative Analysis of Machine Learning Models to Predict the Bankruptcy. *In 2024 12th International Symposium on Digital Forensics and Security (ISDFS)* (pp. 1-6). IEEE.

Kamilaris, A., Fonts, A., & Prenafeta-Boldú, F. X. (2019). The rise of blockchain technology in agriculture and food supply chains. *Trends in Food Science & Technology*, *91*, 640-652.

Kamilaris, A., Fonts, A., & Prenafeta-Boldú, F. X. (2019). The rise of blockchain technology in agriculture and food supply chains. *Trends in food science & technology*, *91*, 640-652.

KPMG. (2018). Blockchain and the future of finance. *KPMG*. Retrieved from https://home.kpmg/xx/en/home/insights/2018/06/blockchain-and-the-future-of-finance.html

Kshetri, N. (2021). Blockchain and sustainable supply chain management in developing countries. *International Journal of Information Management*, *60*, 102376.

Lardo, A., Corsi, K., Varma, A., & Mancini, D. (2022). Exploring blockchain in the accounting domain: a bibliometric analysis. *Accounting, Auditing & Accountability Journal*, *35*(9), 204-233.

Lewis, R., & Cockburn-Wootten, C. (2020). Exploring the impacts of digital transformation on organizational performance: A case study of UK manufacturing firms. *International Journal of Production Research*, 58(6), 1740-1757. https://doi.org/10.1080/00207543.2019.1669423

Moll, J., & Yigitbasioglu, O. (2019). The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *The British accounting review*, *51*(6), 100833.

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system.

Nakamoto, S., & Bitcoin, A. (2008). *A peer-to-peer electronic cash system*. Bitcoin. https://bitcoin.org/bitcoin.pdf

Pizzi, S., Caputo, A., Venturelli, A., & Caputo, F. (2022). Embedding and managing blockchain in sustainability reporting: A practical framework. *Sustainability Accounting, Management and Policy Journal*, *13*(3), 545-567.

Podsakoff, P. M., MacKenzie, S. B., Podsakoff, N. P., & Bachrach, D. G. (2008). Scholarly influence in the field of management: A bibliometric analysis of the determinants of university and author impact in the management literature in the past quarter century. *Journal of Management*, *34*, 641–720.

Vol. 8, No.07; 2024

ISSN: 2456-7760

Procházka, D. (2018). Accounting for bitcoin and other cryptocurrencies under IFRS: A comparison and assessment of competing models. *The International Journal of Digital Accounting Research*, *18*(24), 161-188.

PWC. (2019). Blockchain in accounting. *PWC*. Retrieved from https://www.pwc.com/gx/en/services/legal/blind-chain-in-accounting.html

Rejeb, A., Rejeb, K., Abdollahi, A., & Treiblmaier, H. (2022). The big picture on Instagram research: Insights from a bibliometric analysis. *Telematics and Informatics*, *73*, 101876.

Riehmann, P., Hanfler, M., & Froehlich, B. (2005, October). Interactive sankey diagrams. In *IEEE Symposium on Information Visualization, 2005. INFOVIS 2005.* (pp. 233-240). IEEE.

Rozario, A. M., & Thomas, C. (2019). Reengineering the audit with blockchain and smart contracts. *Journal of emerging technologies in accounting*, *16*(1), 21-35.

Rozario, A. M., & Vasarhelyi, M. A. (2018). Auditing with Smart Contracts. *International Journal of Digital Accounting Research*, 18, 1-27.

Sabuj, S., Arif, A., & Momotaz, B. (2019). Audit Expectation Gap: Empirical Evidence from Bangladesh, SSRG. *International Journal of Economics and Management Studies*, *6*(5), 32-36.

Saha, S., Bishwas, P. C., Das, U., & Arshi, A. S. (2024). Is Fintech Just an Innovation? Impact, Current Practices, and Policy Implications of Fintech Disruptions. *International Journal of Economics, Business and Management Research*, 8(4),174-193. doi.org/10.51505/IJEBMR.2024.8412

Saha, S., Bishwas, P. C., Das, U., & Arshi, A. S. Is Fintech Just an Innovation? Impact, Current Practices, and Policy Implications of Fintech Disruptions.

Saha, S., Hasan, A. R., Islam, K. R., & Priom, M. A. I. (2024). Sustainable Development Goals (SDGs) practices and firms' financial performance: Moderating role of country governance. *Green Finance*, *6*(1), 162-198.https://doi.org/10.3934/GF.2024007

Saha, S., Hasan, A. R., Mahmud, A., Ahmed, N., Parvin, N., & Karmakar, H. (2024). Cryptocurrency and financial crimes: A bibliometric analysis and future research agenda. *Multidisciplinary Reviews*, *7*(8), 2024168-2024168.https://doi.org/10.31893/multirev.2024168

Schmitz, J., & Leoni, G. (2019). Accounting and auditing at the time of blockchain technology: A research agenda. *Australian Accounting Review, 29*(2), 331-342.

Secinaro, S., Dal Mas, F., Brescia, V., & Calandra, D. (2021). Blockchain in the accounting, auditing and accountability fields: a bibliometric and coding analysis. *Accounting, Auditing & Accountability Journal*, *35*(9), 168-203.

Sheldon, M. D. (2019). A primer for information technology general control considerations on a private and permissioned blockchain audit. *Current Issues in Auditing*, *13*(1), A15-A29.

Trieschmann, J. S., Dennis, A. R., Northcraft, G. B., & Niemi, A. W. (2000). Serving multiple constituencies in business schools: MBA program versus research performance. *Academy of Management Journal*, *43*, 1130–1141.

Zhou, Q., Huang, H., Zheng, Z., & Bian, J. (2020). Applications of blockchain technology in finance: A review. *Journal of Financial Services Research*, 1-17.