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Review

Navigating the Future: Blockchain's Impact on Accounting and Auditing Practices

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Abstract: This study seeks to meticulously analyze the scholarly discussion on the integration of blockchain technology into accounting and auditing. Based on a total of 67 articles from the Web of Science (WoS) database, this study adopts a bibliometrics and content analysis approach which uses both numerical and visualization techniques to examine the extant literature. It spans the timeframe between 2016 and 2022. Bibliometrix R-package (Biblioshiny, version 4 is employed to analyze the descriptive analysis, which includes publication trends, the most trustworthy sources of scientific publications, prominent scientific authors, prominent documents, and country collaborations. VOSviewer software Version 1.6.20, is used for a network visualization of keywords and bibliographic coupling. Leveraging the content analysis, this research reveals three fundamental themes: first, the use of blockchain technology to strengthen financial reporting systems; second, blockchain technology and the future of auditing; and third, the valuation of cryptocurrencies. Research gaps in the current literature include a lack of comprehensive studies on blockchain's regulatory and governance aspects in accounting, insufficient exploration of risks and challenges in adopting new technologies in auditing, and a limited understanding of tax consequences, disclosure requirements, and regulatory frameworks for cryptocurrencies, necessitating future research endeavors. Thus, this study extends existing theoretical insights by exploring blockchain's role in financial reporting, its transformative impact on auditing, and the possible adaptation or development of new valuation methods for cryptocurrencies. It further identifies and discusses future research directions, contributing to potential novel frameworks for addressing regulatory, governance, and socio-economic dimensions of blockchain integration into accounting and auditing practices.

Keywords: blockchain technology; financial reporting; accounting; auditing; bibliometric analysis; content analysis

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1. Introduction

Worldwide, blockchain technology is expected to achieve USD 1235.71 billion by 2030 compared to USD 5.85 billion in 2021 (a compounded annual growth of 82.8%), effectively underscoring the growing importance and widespread adoption of blockchain technology in diverse industries globally. The year 2016 is commonly known as a significant milestone in the accounting discipline as it marked the emergence of blockchain technology [1–4]. This milestone resulted in substantial transformations, fundamentally altering how accounting and auditing processes and transactions are managed. While it is acknowledged by certain scholars that the focus of blockchain is more aligned with cryptography rather than accounting [5], it is undeniable that blockchain technology has the capacity to significantly impact and transform all spheres of accounting. Its ability to automate a range of

accounting processes will eliminate the need for human involvement in routine tasks and significantly improve the speed and effectiveness of accounting processes [6,7]. From an auditing perspective, blockchain provides auditors with near-real-time secure and transparent data via "read-only" blockchain nodes, facilitating procedures and competencies for data and evidence extraction and assessment in a consistent and recurring manner, thus allowing for greater transparency and visibility in the auditing process.

Recognizing the significant roles played by accounting and auditing in economic systems, the primary objective of this research endeavor is to utilize a rigorous scientific methodology to conduct an extensive analysis of the existing literature within the domain of blockchain applications in the fields of accounting and auditing. This comprehensive analysis encompasses diverse aspects, including publication trends, prominent publications, authors, journals, and country collaborations. More importantly, this study meticulously examines the resulting thematic elements that provide a comprehensive overview of the knowledge landscape pertaining to blockchain applications in accounting and auditing. Research gaps in the current literature include a lack of comprehensive studies on blockchain's regulatory and governance aspects in accounting, insufficient exploration of risks and challenges in adopting new technologies in auditing, and a limited understanding of tax consequences, disclosure requirements, and regulatory frameworks for cryptocurrencies, necessitating future research endeavors. Thus, further research in this domain can contribute to the effective integration of blockchain technology into accounting and auditing practices and may unveil novel frameworks that address the intricate dimensions of regulation, governance, and socio-economic factors inherent in blockchain integration within these professional domains.

Studies have explored blockchain technology in the field of accounting, employing structured literature reviews and bibliometric analyses. Refs. [8–10] represent recent examples of such studies, focusing on the intersection of blockchain technology and various domains within the field of accounting. Ref. [10] presented a comprehensive summary of the subjects covered in an *AAAJ* special issue, drawing from a set of eight articles, two of which employed bibliometrics approaches. The authors concluded that the research on blockchain technology is currently in an exploratory stage, emphasizing the need for further empirical investigation to derive definitive conclusions regarding the potential impact of blockchain on accounting, auditing, and accountability domains. The authors of [9] adopted a meticulous approach by examining 153 academic papers published from 2008 to June 2020, extracted from diverse databases. The researchers' analysis revealed four recurring themes in the literature: the evolving role of accountants, new challenges for auditors, opportunities and difficulties associated with the use of blockchain technology, and legal issues relating to crypto-assets. Similarly, the authors of [8] investigated the discipline by analyzing 346 research articles sourced from the Scopus database as of January 2022. Employing bibliometrics analyses, they critically discussed the impact of blockchain technology on accounting and auditing, implications for crypto-assets and finance, and the transformation of business models and supply chain management.

As a continuation of the above studies and to contribute further to the scholarly discussion on blockchain technology in accounting and auditing, the present study also adopts a similar methodology, specifically focusing on the recent trends in and empirical findings on accounting, auditing, and reporting for cryptocurrency. To complement the previous research efforts, this study utilizes the Web of Science (WoS) database, providing a different perspective and expanding the scope of analysis. The dataset includes articles published until December 2022, ensuring coverage of the latest developments and insights in the field. This study highlights how blockchain is reshaping accounting and auditing practices by comprehensively synthesizing the existing literature, identifying themes, trends, and growth directions, and contributing theoretically by outlining the field's scope, growth paths, and convergent/divergent areas. This study's added contribution lies in its comprehensive analysis of the proposed future research by theme, which is anticipated to make a significant impact on academic scholarship and a practical contribution. The

future research proposed herein could serve as a foundational framework and explore diverse areas of research, fostering advancements and driving further scholarly discussion, specifically regarding aspects of governance, current practices, and the challenges faced in the current implementation stage of blockchain technology in accounting and auditing. It should contribute toward exploring financial reporting processes through innovative approaches, such as blockchain-based triple-entry bookkeeping, added supplementary verification and transparency, and the solidification of trust and accuracy in financial reporting. Auditing professionals could benefit from the latest updates on blockchain auditing and understanding blockchain-based audit evidence, equipping them with the necessary knowledge and skills to leverage blockchain technology effectively, improving audit effectiveness, risk assessment and control considerations, effective audit reporting and communication strategies, and efficiency while offering innovative services. The findings are expected to greatly enhance the body of knowledge in the field of blockchain technology application in accounting and auditing.

This study has vital significance and importance for several compelling reasons. First, in an era marked by accelerating technological advancements, the adoption of blockchain in these domains has the potential to revolutionize traditional practices, promising enhanced efficiency, transparency, and security. Given the rapidly evolving landscape of digital finance and the imperative to stay ahead of technological disruptions, it is essential for academia, practitioners, and regulatory bodies to comprehend the multifaceted ramifications of blockchain's implementation [11]. Second, the global financial ecosystem is increasingly reliant on real-time, trustworthy financial data. Blockchain, with its immutable ledger and cryptographic verification, offers a paradigm shift in ensuring the integrity and accuracy of financial information. This becomes particularly significant in an age of mounting financial complexities, heightened regulatory scrutiny, and the demand for real-time, high-quality financial reporting. Furthermore, substantial investments and attention from leading accounting firms and regulatory institutions underscore the immediate relevance of this study. The necessity to navigate the intricate challenges and opportunities presented by blockchain in accounting and auditing, including potential disruptions to established business models, ethical considerations, and the evolving role of professionals, is both pressing and unavoidable. Thus, this study's urgency and novelty are underscored by the transformative potential of blockchain in accounting and auditing, the increasing reliance on accurate financial data, understanding its implications, risks, and challenges, and the presence of governance and regulatory controls for maintaining integrity and effectiveness [12].

2. Literature Review

2.1. Blockchain Technology and Accounting

The integration of blockchain technology into accounting has the potential to revolutionize financial record-keeping [13,14]. This innovation offers an immutable and transparent ledger, significantly transforming traditional accounting processes. As suggested in [14–16] by leveraging decentralized and secure data storage [17], the risk of fraudulent activities is mitigated [18]. The cryptographic nature of blockchain ensures data integrity, reducing the likelihood of tampering or unauthorized alterations. Furthermore, the transparency embedded in blockchain technology enhances the trustworthiness of financial transactions [16,19,20]. Stakeholders can access a shared real-time ledger, fostering accountability and reducing the opacity inherent in traditional accounting systems. This transformative potential underscores the broader implications of blockchain in redefining the foundations of financial record-keeping, paving the way for more secure, efficient, and transparent accounting practices. Implementing this technology can enhance the accuracy and security of financial information [20–22] leading to a reduced likelihood of accounting errors and improved information security [23,24]. It also has the potential to streamline accounting procedures, boost the precision and trustworthiness of financial data [3,20], offer more efficient control mechanisms, and mitigate risks for businesses [25,26].

Blockchain technology also records transactions across several workstations using an immutable alphanumeric recording method without modifying subsequent blocks [27], elaborating on its impact. This decentralized and tamper-resistant method of recording transactions across multiple workstations, employing an immutable alphanumeric process, has profound implications. It ensures that once a transaction is recorded in a block, it cannot be altered or deleted without consensus from the network participants. This unalterable nature significantly enhances the security and trustworthiness of the recorded information. It enables consensus-based record-keeping without an intermediary, thus decreasing fraud and mistakes [13,16,28]. Its almost real-time settlement, dispersed ledger, irreversibility censorship, and resistance could improve the accounting profession and reduce risks of non-payments, transaction substantiation, verifiable records, and block validation [29,30]. This could further lower ledger maintenance and reconciliation expenses, influencing financial reporting and taxes [31,32]. Blockchain transactions are also permanent and transparent [33,34], preserving financial activity. Blockchain fosters a sense of trust, mitigates instances of fraudulent activities, and amplifies the level of accountability, thereby instigating a transformative effect on conventional financial systems through the provision of a secure and transparent ledger for the facilitation of transactions. Blocks store transactions progressively and uniquely. They are encrypted and authenticated through a standard protocol [13,14,35,36]. Blockchain accounting requires smart contracts [37–40] which automatically execute when certain conditions are met. The technique saves data in numerous copies via a distributed peer-to-peer system, minimizing tampering [19].

Having said that, blockchain in accounting has technological obstacles; blockchain scalability [13,41–43] is a major issue. Processing transactions become increasingly complicated and resource-intensive as the blockchain's ledger expands, and some firms may be deterred by slower transaction times and higher costs [44,45]. Blockchain compatibility is another technological issue as several blockchain systems and protocols have distinct characteristics and capabilities [46,47]. Businesses may find it challenging to deploy blockchain-based accounting solutions that are compatible with current systems and procedures. Though blockchain technology appears to be highly disruptive [48], it is a competent emerging technology with the capacity to fully re-structure the accounting and auditing environment as well as the competency of the work within it [1,14,49,50]. In order to promote the widespread adoption of this innovation, it is crucial to identify the factors that affect people's attitudes and intentions to embrace and implement blockchain technology in accounting practices [51].

2.2. Blockchain Technology and Auditing

Blockchain technology has the potential to also revolutionize the auditing sector by offering a secure, transparent, and automated method of conducting audits. Recent studies [52,53] suggest that blockchain implementation can enhance the speed and effectiveness of auditing procedures. By providing a permanent and unalterable record of transactions, blockchain can help auditors verify the accuracy of financial information and ensure document integrity [54]. Smart contracts allow for automated processes, reducing time and resource requirements while quickly identifying inconsistencies and areas of concern [55]. Furthermore, blockchain enables auditors to access and analyze data from various sources more efficiently. It establishes a decentralized ledger that provides a complete and reliable record of financial data, facilitating insights and pattern recognition. Blockchain technology also enhances security and mitigates fraud risks [13]. Through its tamper-proof nature, it prevents fraudulent acts such as double-spending and data tampering, thereby increasing auditors' trust in financial data quality. Lastly, blockchain has the potential to foster stakeholder trust and confidence in auditing procedures. By offering a secure and transparent mechanism for audits, blockchain builds confidence among investors, regulators, and the public [3,20]. This, in turn, enhances the reputation of auditors and the organizations they audit, leading to increased investment and growth.

The authors of [22] discussed blockchain's impact on auditing practices and stated that blockchains can be permissionless and permissioned. Permissionless means that the transaction records can be shared, are monitored by all network users, and are open to everyone. On the other hand, a permissioned blockchain places more restrictions on network users and control procedures which results in higher governance mechanisms and an effect on internal and external audits. Thus, a blockchain is a strategy of transforming the auditing process from traditional to "on-chain" transactions in any period. A similar study [3] examined several resources such as literature reviews, professional reports, and websites to identify taxonomy themes. The study concluded that blockchain affects the implication of the auditing profession. On one hand, using a blockchain poses many challenges such as fully integrating blockchain technology with the field of auditing, which requires more consensus between regulators and auditors [13]. On the other hand, the authors of [56] concluded that blockchains are a good solution to save time and overlap work in auditing practices as well as good control mechanisms to prevent fraud, but blockchain technology does not have enough evidence and integrity in the auditing profession; a similar result was found in United Arab Emirates in [57]. Also, blockchains and artificial intelligence affect real-time trusted data for the AI systems used by auditors to improve assurance and efficiency [20]. Another study [58] in Switzerland used the grounded theory for an in-depth understanding of the effect of blockchain on auditing practices. They concluded that there are no potential disruptive effects on the auditing profession, but it could shift in terms of becoming more IT-oriented, and the audit profile total will be changed, which supports the same results found in [59]. In addition, Ref. [60] supported the idea that blockchain technology cannot replace personal auditors' professionalism, but it can be used to reinvent old practices rather than overwhelm them. A banking sector study [61] conducted in Egyptian banks from 2017 to 2021 concluded that the effect of blockchain technology on auditing has six key levels in terms of saving time and improving efficiency, using all whole-population-instated samples, focusing on audit testing, setting up a continuous audit process, playing a more strategic auditing role, and developing new advisory services. Also, the study concluded that blockchain improved audit quality in the banking sector.

Therefore, blockchain technology poses various risks and challenges related to security, reliability, and verification which need to be addressed through effective governance. In this regard, previous studies set several key points and argued the importance of governance mechanisms for control. Firstly, security and facing risks such as double spending, smart contract vulnerabilities, and privacy concerns can compromise blockchain security [62,63]. Thus, governance should focus on protection against attacks, code reviews, security audits, and data privacy [63]. Secondly, regarding reliability, scalability issues, network forks, and consensus mechanism choices can impact a blockchain's reliability [64,65]. Therefore, governance plays a critical role in decisions regarding upgrades, network stability during forks, and consensus algorithm selection [64,65]. Finally, with regard to verification, the challenges related to identity verification, data integrity, and regulatory compliance need governance solutions [66,67]. Thus, establishing standards for identity verification, data accuracy, and regulatory compliance is essential. Overall, effective governance is essential to address these issues and ensure the security, reliability, and accuracy of blockchain networks. Regulatory bodies, industry consortia, and blockchain project teams must collaborate to establish governance frameworks that protect participants and maintain network integrity, especially in the accounting and auditing profession.

Finally, there are several recent research concepts such as BlockASP, AOP, and OSM that have argued their relationships with the auditing profession. BlockASP is a research framework designed for verifying the correctness and reliability of blockchain systems using Aspect-Oriented Programming (AOP) and model-checking techniques [68–70]. AOP allows for modularizing various aspects of blockchain functionality, while model checking systematically validates the blockchain system against specified properties. The framework aims to enhance the security and verification of blockchain systems by addressing

their complexity through structured and formalized development and verification processes. It serves as a tool for researchers and developers to improve the trustworthiness of blockchain technology. BlockASP, a framework for verifying the correctness and reliability of blockchain systems, aligns with auditing practices in several ways [71,72]. It can assist auditors in conducting security, compliance, and data integrity audits, especially in the context of blockchain-based financial transactions. BlockASP's AOP-based model checking and focus on regulatory compliance provide valuable tools for auditors to assess security, accuracy, and adherence to regulations within blockchain systems. This framework can enhance the reliability and trustworthiness of blockchain-based financial operations, a critical aspect of auditing in this context [71,72]. Moreover, the advanced observe-based statistical model-checking (OSM) framework helps the leveraging model check for observing dynamic behaviors in aspect-oriented applications [68,73]. This framework could indirectly relate to auditing practices by offering insights into software auditing. Moreover, OSM emphasizes the use of model checking to observe and assess the dynamic behaviors of software systems [74,75], which is essential for auditors who need to evaluate the security, reliability, and compliance of financial software.

Thus, blockchain technology could improve the auditing profession regarding security, reliability, and verification by providing an immutable and transparent ledger that enhances the security and reliability of financial records. In addition, real-time and continuous auditing on a blockchain enables proactive issue identification. At the same time, smart contracts automate audit procedures and reduce the risk of human error, improving both security and reliability. Moreover, the technology's ability to verify data accuracy and reduce fraud risk enhances the audit process's reliability and security. Additionally, blockchain supports privacy and regulatory compliance, ensuring secure audits without violating data privacy regulations and increasing the reliability of compliance audits. Overall, blockchain enhances the trustworthiness and effectiveness of the auditing profession.

2.3. Blockchain Technology and Cryptocurrencies

Blockchain technology, which is based on the principles of the Bitcoin cryptocurrency [76], has attracted a lot of interest since it offers improved security and anonymity for a variety of applications. However, the current research being conducted in this particular area of study unveils a multifaceted and intricate terrain. The authors of [77] emphasize the potential of Proof-of-Work techniques and dynamic Public Keys in safeguarding transaction security and user privacy. Nevertheless, the authors of [61] assert that despite its revolutionary potential, the general acceptance of blockchain technology continues to pose a substantial challenge. The achievement of success in this undertaking is significantly impacted by various aspects, such as regulatory assistance and user experience, as extensively examined in [78]. The aforementioned difficulties necessitate a thorough examination in order to fully use the promise of blockchain technology. The exponential growth of blockchain technology has led to its widespread adoption across several domains. One study [79] highlights China's notable emphasis on the integration of blockchain technology across many industries and smart cities. In contrast, international research largely centers around the implications of blockchain technology within the financial sector. However, Ref. [80] highlights the unique issues associated with the legal recognition of cryptocurrencies, which are supported by blockchain technology. Additionally, it should be noted that there are certain disparities between the capabilities of blockchain technology and the unique requirements of the FinTech business, as highlighted in [81]. The presence of this incongruity warrants a more thorough examination in order to successfully reconcile the disparity.

The continuously developing blockchain ecosystem has extensive ramifications that extend beyond the realm of technology, influencing societal trust and institutional dynamics, as demonstrated by the research conducted in [82]. Concurrently, there is a growing trend in the integration of cryptocurrencies into the realm of electronic commerce, leveraging the robust security attributes of blockchain technology to enhance their acceptance and utilization [83]. Nevertheless, the ever-evolving nature of blockchain technology

emphasizes the necessity of thorough surveys aimed at identifying vulnerabilities and proactively preparing for future advancements. The interrelationship between blockchain technology and cryptocurrencies is apparent within the financial domain since the profitability of cryptocurrencies is closely linked to the performance of enterprises utilizing blockchain-based technology, as stated in [84]. The importance of regulatory monitoring, managerial engagement, and investor participation is highlighted by this symbiotic relationship [85]. Furthermore, the authors of [86] argue that these innovations are fundamentally transforming the social and solidarity-based finance sectors, with blockchain technology emerging as a potentially disruptive influence. However, the emergence of digital finance presents certain obstacles in meeting the financial requirements of low-income groups, notwithstanding its advantages [87]. Moreover, the interdependent development of blockchain technology, crowdfunding platforms, cryptocurrencies, and initial coin offerings (ICOs) represents a significant transformation in the public dialogue surrounding entrepreneurial financing, as evidenced by the research conducted in [88]. In conclusion, Industry 4.0 has a great deal of promise for blockchain technology, but in order to detect and address any security flaws, constant monitoring is necessary [89,90]. These multifaceted developments underscore the importance of continuous scrutiny and proactive engagement from stakeholders in the financial landscape.

3. Materials and Methods

This research employs a bibliometric analysis to examine the scholarly literature and academic discourse concerning blockchain technology in accounting and auditing. Numerical and graphical strategies are utilized, aligning with earlier studies [91,92]. Web of Science (WoS) is chosen for its rigorous and quality-focused coverage of reliable journals, supporting this study's purpose [47,65]. Bibliometrix and VOSviewer are employed for a thorough analysis and visualization of the scholarly landscape. Bibliometrix enables various academic analyses, addressing research questions related to publication trends, authors, sources, and collaboration patterns (RQ1 and RQ2). VOSviewer aids in network visualization and bibliographic coupling pertinent to thematic analysis and future research (RQ3 and RQ4). These methodological tools collectively serve the study's objectives in comprehensively exploring blockchain's role in accounting and auditing, as exhibited in the following research questions.

RQ1: What are the trends in publications on blockchain technology within the realms of accounting and auditing?
RQ2: Which are the major sources, documents, authors, institutions, and countries contributing toward blockchain technology within the realms of accounting and auditing?
RQ3: What are the major themes of blockchain technology within the realms of accounting and auditing?
RQ4: What are potential future areas of research on blockchain technology within the realms of accounting and auditing?

3.1. Data Extraction and Inclusion and Exclusion Criteria

For this bibliometric analysis, the Web of Science Core database was searched extensively beginning in January 2023 in order to gather data regarding the papers. A systematic search was performed, including the title, abstract, and keyword list, utilizing the specified terms "blockchain in accounting" OR "blockchain in auditing." This meticulous process yielded the discovery of a total of 999 scholarly publications. The study employed stringent criteria for inclusion and exclusion, and a comprehensive search was subsequently conducted using the terms "Economics" and "Management." This process yielded a curated selection of 402 scientific papers. These domains exhibit a strong correlation with accounting and auditing, thereby offering a complete comprehension of the economic and managerial implications associated with the use of blockchain technology in accounting and auditing practices. The utilization of these specific keywords aligns with prior bibliometrics investigations into the application of blockchain technology in the fields of accounting and auditing, as demonstrated by the scholarly works described in [4,93]. Incorporating these

specific terms into the search strategy guarantees that the study encompasses pertinent scholarly literature that offers valuable perspectives on the economic and managerial consequences of blockchain technology in the fields of accounting and auditing. Following this, the scope was refined to encompass scholarly articles exclusively published in the English language within the disciplines of economics, business, business finance, and management. As a result, a total of 203 pertinent academic publications were identified. A more precise selection was made by implementing filters to exclusively include papers classified as "Article" or "Early Access" and published within the timeframe of 2016 to 2022. This resulted in a final corpus consisting of 67 articles. The search technique and criteria for source selection were developed with the aim of maintaining a rigorous and high level of quality, as indicated in [47]. The chosen methodological approach is consistent with the norms of bibliometric analysis and guarantees the thorough inclusion of pertinent scholarly literature in the domain of blockchain in accounting and auditing.

3.2. Data Analysis

To analyze the data, we employed the Bibliometrix R-package Version 4 (Biblioshiny) application [94] for a descriptive analysis [91], as well as the VOSviewer software 1.6.20 [94] for a network visualization of keywords and bibliographic coupling [91,92]. In the bibliometrics section, we examined the summary of the main information, publication trends, most relevant authors, sources, affiliations, documents, and a country collaboration analysis. VOSviewer was used for clustering the network—"keyword analysis" and "bibliographic coupling" [94]. Based on the bibliographic coupling, this study performed a content analysis and identified themes and future research for blockchain adoption in accounting and auditing. Figure 1 delineates the search criteria (keywords, inclusion, and exclusion) and the subsequent analysis.

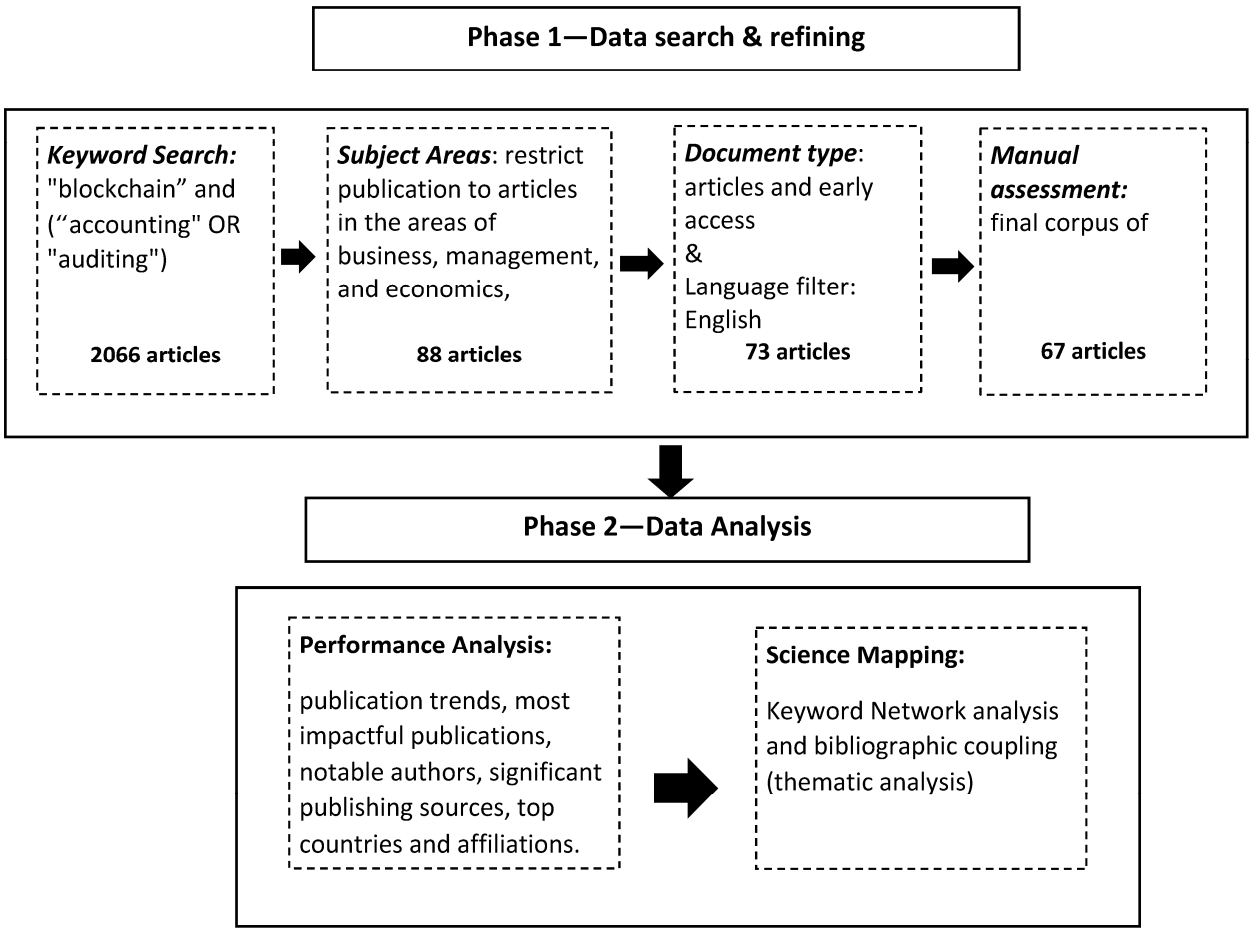

Figure 1. Search parameters and data analysis framework.

For the descriptive analysis, we used the Bibliometrix R-package (Biblioshiny) application [94], and for the network visualization of keywords and bibliographic coupling, we used VOSviewer software [91,92,94]. In the bibliometrics section, we conducted an analysis of several aspects including a summary of the main information, publication trends, most relevant authors, sources, affiliations, documents, and a country collaboration analysis. The clustering of the network was conducted using VOSviewer, a software tool that employs techniques such as keyword analysis and bibliographic coupling [94]. This study utilized bibliographic coupling to conduct a content analysis, resulting in the identification of themes and potential avenues for future research pertaining to blockchain adoption in accounting and auditing. Figure 1 illustrates the search parameters employed, including keywords as well as the criteria for inclusion and exclusion. The subsequent analysis is also depicted in the figure.

4. Results

Utilizing a dataset comprising 67 articles sourced from the Web of Science database, we conducted a comprehensive bibliometric analysis employing VosViewer and the BiblioShiny package. Following this, we undertook a content analysis to identify research themes or clusters that aligned with the co-occurrence network and three-field plots. This meticulous approach granted us an exceptional and profound comprehension of how blockchain technology plays a pivotal role in advancing accounting and auditing.

4.1. Main Information

Table 1 provides an overview of the data used in the current study. The dataset comprises 67 relevant documents obtained from 32 distinct academic sources, reflecting a comprehensive collection of references. An analysis of the keywords indicates a diverse range of associated terms and concepts. Spanning the period from 2016 to 2022, the dataset encompasses the recent literature on the topic, with an average citation rate of 12.72 citations per document, indicating a significant level of involvement and acknowledgment within the academic community. The dataset involves 170 authors, with 5 single-authored and 62 multi-authored documents (collaboration index: 2.75), suggesting a proclivity toward collaborative research practices. The average number of authors per document is 2.62, with 2.82 co-authors per multi-authored document. This dataset comprehensively represents the scholarly landscape, featuring diverse literature, extensive author collaboration, and up-to-date insights.

Table 1. Data summary.

Description	Results
Documents	67
Sources	32
KeyWords Plus (ID)	121
Author's keywords (DE)	211
period	2016–2022
Average citations per document	12.72
Authors	170
Author appearances	183
Authors of single-authored documents	5
Authors of multi-authored documents	165
Single-authored documents	5
Documents per author	0.382
Authors per document	2.62
Co-Authors per documents	2.82
Collaboration index	2.75

4.2. Publication Trend

Figure 2 demonstrates a significant increase in publications related to the utilization of blockchain technology in accounting and auditing from 2016 to 2022, with a notable surge in 2021. This indicates the emergence of scholarly discourse on the transformative potential of blockchain in financial record-keeping, data verification, and audit trails. Researchers and practitioners are increasingly recognizing the possibilities offered by blockchain and exploring how it can enhance transparency, efficiency, and security in accounting and auditing practices. The shift in focus to investigating the benefits, drawbacks, and consequences of integrating blockchain reflects a growing understanding of its potential to improve financial transactions' security, efficiency, and transparency.

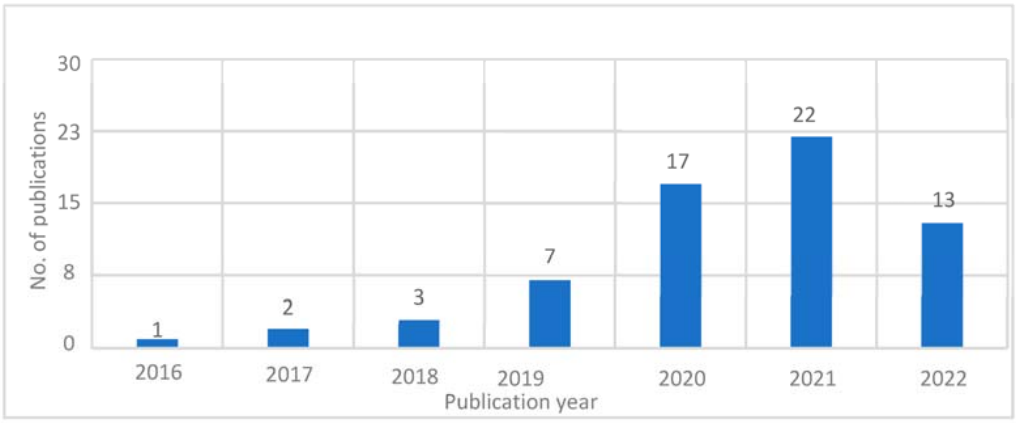

Figure 2. Publication trends from 2016–2022 (WoS database). Source: Web of Science database.

4.3. Most Cited Document

Table 2 presents an overview of the scholarly contribution that centers on the application of blockchain technology in the fields of accounting and auditing and the subsequent effects it has on the professional landscape across different nations. Renowned in blockchain for accounting and auditing, Jun Dai's paper "Towards Blockchain-Based Accounting and Assurance" in the *Journal of Information Systems* (205 citations, 34.167 per year) illustrates blockchain's role in facilitating a real-time, verifiable, and transparent accounting ecosystem. Another prominent paper titled "Do health information technology investments impact hospital financial performance and productivity?", published in the *International Journal of Accounting Information Systems* (78 citations, 15.6 per year) [34], examines the correlation between health information technology investments and hospital financial performance and productivity. The rest of the publications in Table 2 examine the convergence of emerging technologies like blockchain and digitization with accounting and auditing. They illuminate how blockchain can enhance data reliability and transparency in accounting, and explore the impact of digitization on auditing, including adapting to dynamic circumstances like the COVID-19 pandemic. Frameworks for leveraging blockchain are discussed, offering a comprehensive understanding of its potential disruptive influence. Collectively, these papers guide navigating the dynamic landscape of accounting and auditing in the digital era [95].

Table 2. Most cited documents.

Authors	Document	Publication Year	Source	Total Citations	TC per Year
Jun Dai and Miklos A. Vasarhelyi [14]	"Toward Blockchain-Based Accounting and Assurance"	2017	*Journal of Information Systems*	205	34.167
Tiankai Wang, Yangmei Wang and Alexander McLead [34]	"Do health information technology investments impact hospital financial performance and productivity?"	2018	*International Journal of Accounting Information Systems*	78	15.6
Joshua G. Coyne and Peter L. McMickle [49]	"Can blockchains serve an accounting purpose?"	2017	*Journal of Emerging Technologies in Accounting*	68	11.333
Victor Tiberius and Stefanie Hirth [96]	"Impacts of digitization on auditing: A Delphi study for Germany"	2019	*Journal of International Accounting, Auditing and Taxation*	43	10.75
Manlu Liu, Kean Wu, Jennifer Jie Xu [22]	"How will blockchain technology impact auditing and accounting: Permissionless versus permissioned blockchain"	2019	*Current issues in auditing*	36	9
Boon Seng Tan and Kin Yew Low [97]	"Blockchain as the Database Engine in the Accounting System"	2019	*Australian Accounting Review*	29	7.25
Mário Marques, Carlos Pinho, and Tânia Menezes Montenegro [98]	"Reengineering the audit with blockchain and smart contracts"	2019	*Journal of emerging technologies in Accounting*	27	6.75
John McCallig, Alastair Robb, and Fiona Rohde [99]	"Establishing the representational faithfulness of financial accounting information using multiparty security, network analysis, and a blockchain"	2019	*International Journal of Accounting Information Systems*	26	6.5
Khaldoon Albitar, Ali Meftah Gerged, Hassan Kikhia, and Khaled Hussainey [100]	"Auditing in times of social distancing: the effect of COVID-19 on Auditing quality"	2021	*International Journal of Accounting & Information Management*	24	12
Tatiana Morozova, Ravil Akhmadeev, Liubov Lehoux, Alexei Yumashev, Galina Meshkova, and Marina Lukiyanova [101]	"Crypto asset assessment models in financial reporting content typologies"	2020	*Entrepreneurship and Sustainability Issues*	23	7.667

Source: Biblioshiny R-package.

4.4. Most Prolific Authors and Affiliations

Table 3 shows the h-index, citations, and affiliations of prominent accounting and auditing authors. Miklos A. Vasarhelyi, a distinguished author from Rutgers University, has an outstanding h-index and citations. His work includes audit analytics, continuous auditing, and blockchain applications in accounting and auditing. Jun Dai of Michigan Technology University has also made significant contributions to blockchain-based accounting and assurance. KY Low and BS Tan, both from Nanyang Technological University, have contributed to areas of audit quality and accounting information systems. Additionally, authors such as John Carroll University's MD Sheldon specialize in auditing and accounting ethics, while B. Boulianne of Concordia University, E. Pimentel of Queen's University, and Alexander Kogan of Rutgers Business School have contributed to areas including blockchain-based assurance and accounting, applications of transformational technology in auditing, and the effect of health information technology on financial performance. Their prolific output and impactful work contribute to the evolving knowledge landscape in technology-implied accounting and auditing research, further enriching scholarly discourse and shaping the direction of future research [102,103].

Table 3. Most prolific authors.

Author	h-Index	Citations	Affiliation
Miklos A. Vasarhelyi	60	14,764	Rutgers University
Jun Dai	10	1696	Michigan Technology University
Kin-Yew Low	10	1229	Nanyang Technological University
Boon-Seng Tan	7	437	Nanyang Technological University
Mark Sheldon	8	278	John Carroll University
Emilio Boulianne	11	808	Concordia University
Erica Pimentel	4	145	Queen's University
Alexander Kogan	41	7552	Rutgers Business School

Source: authors' elaborations based on Biblioshiny R-package.

4.5. Most Cited Sources

Table 4 and Figure 3 provide insights into the most cited sources and key themes in blockchain application research within accounting and auditing. Prominent journals like the *Journal of Emerging Technology in Accounting*, *Accounting*, *Organizations and Society*, and the *Journal of Information Systems* have published influential studies. The involvement of journals affiliated with the American Accounting Association (AAA) and other renowned accounting journals highlights the recognition and popularity of blockchain-related research. Figure 3 illustrates the interconnectedness of sources, keywords and authors, emphasizing the focus on audit, blockchain, accounting, cryptocurrency, and blockchain technology. These findings underscore the scholarly attention given by reputable journals to the potential of blockchain in enhancing auditing processes, transforming accounting methodologies, and addressing the implications of digital currencies in financial reporting.

Table 4. Most cited sources.

Sources	Citations	ABDC Ranking	ABS Ranking	SJR	Publisher
Journal of Emerging Technology in Accounting	127	B	1	Q2	American Accounting Association, Lakewood Ranch, FL, USA
Accounting Organization and Society	82	A *	4 *	Q1	Elsevier, Amsterdam, The Netherlands,
Journal of Information System	80	A	1	Q1	American Accounting Association, Lakewood Ranch, FL, USA
Accounting Auditing and Accountability Journal	48	A *	3	Q1	Emerald Group Publishing Ltd., Bradford, UK
Australian Accounting Review	47	B	2	Q2	Wiley-Blackwell Publishing Ltd., Hoboken, NJ, USA
Accounting Horizon	45	A	3	Q1	American Accounting Association, Lakewood Ranch, FL, USA
Journal of Corporate Accounting and Finance	42	B	-	Q2	Wiley-Blackwell, Hoboken, NJ, USA
MIS Quarterly	32	A *	4 *	Q1	Management Information Systems Research Center, Minneapolis, MN, USA
Current Issues in Auditing	31	B	2	Q2	American Accounting Association, Lakewood Ranch, FL, USA
Meditari Accountancy Research	27	A	1	Q1	Emerald Group Publishing Ltd., Bradford, UK
Critical Perspectives in Accounting	26	A	3	Q1	Academic Press Inc., Cambridge, MA, USA
Accounting Review	25	A *	4 *	Q1	American Accounting Association, Lakewood Ranch, FL, USA
AUDITING: A Journal of Practice & Theory	25	A *	3	Q1	Emerald Group Publishing Ltd., Bradford, UK
International Journal of Information Management	25	A *	2	Q1	Elsevier Ltd., Amsterdam, The Netherlands
Technological Forecasting and Social Change	25	A	3	Q1	Elsevier Ltd., Amsterdam, The Netherlands

Source: authors' elaborations based on Biblioshiny R-package.

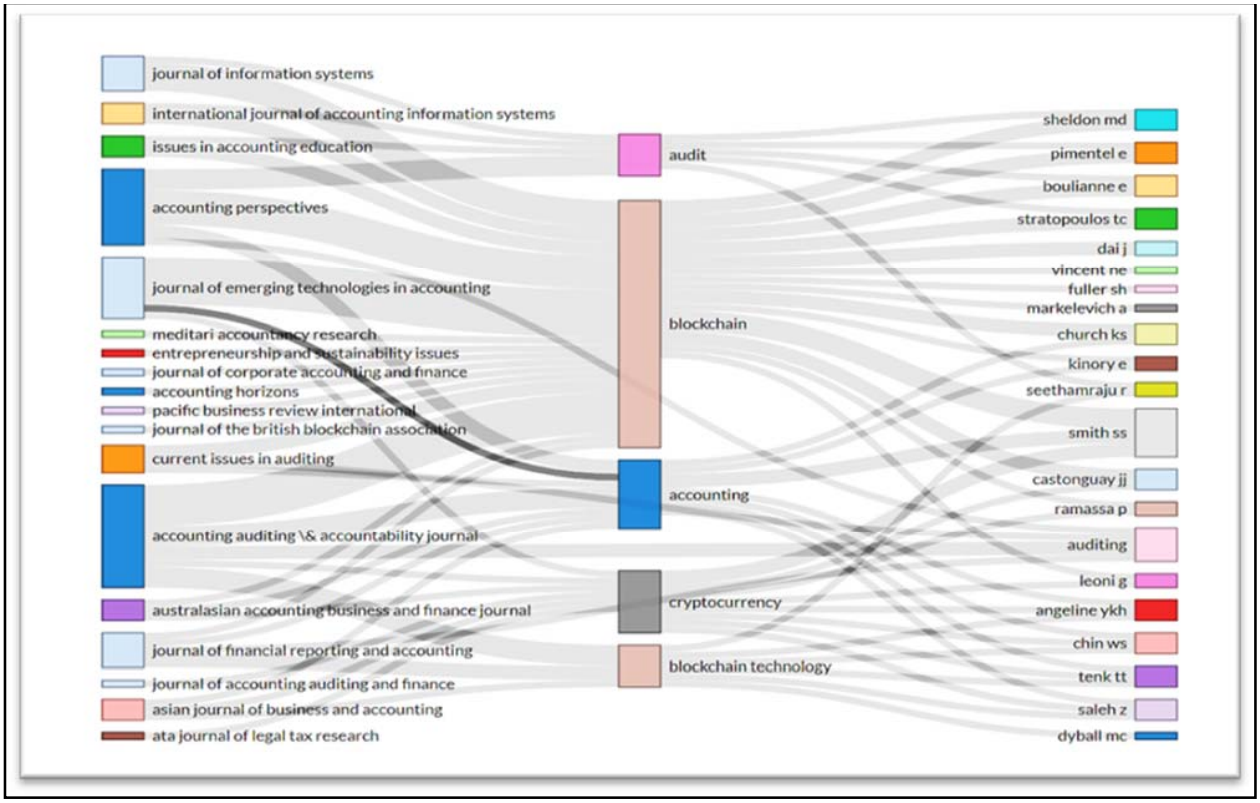

Figure 3. Three-field plot (source, keyword, and authors). Source: Biblioshiny R-package.

4.6. Countries with the Highest Scientific Production

The analysis of Table 5 reveals that the USA has the highest number of publications in the field of blockchain technology in accounting and auditing, followed by Canada, Australia, Romania, Italy, and the United Kingdom. This indicates that the examination of blockchain technology in these areas is more prevalent in the USA and Anglo-Saxon countries compared to the Asia–Pacific region. It also underscores the significance of fostering research collaboration in the Asia–Pacific region to contribute to the evolving understanding and utilization of blockchain in the field. Furthermore, Figure 4 visually represents the relationships between countries, keywords, and sources in the field. It demonstrates that researchers worldwide share common keywords such as blockchain, technology, accounting, and auditing, indicating a shared focus and interest in exploring the applications and implications of blockchain in accounting and auditing.

Table 5. Countries with the highest scientific production.

Region	Number of Publications	Total Citation	Region	Number of Publications	Total Citation
United States of America	61	512	Czech Republic	4	2
Canada	20	31	Jordan	4	3
Australia	16	19	New Zealand	4	0
Romania	16	9	Germany	3	43
Italy	15	37	Malaysia	3	0
United Kingdom	13	35	South Africa	3	16
Ukraine	11	2	Croatia	2	0
China	9	15	Ireland	2	26
India	6	0	Poland	2	0
Russia	5	23	Singapore	2	21

Source: Biblioshiny R-package.

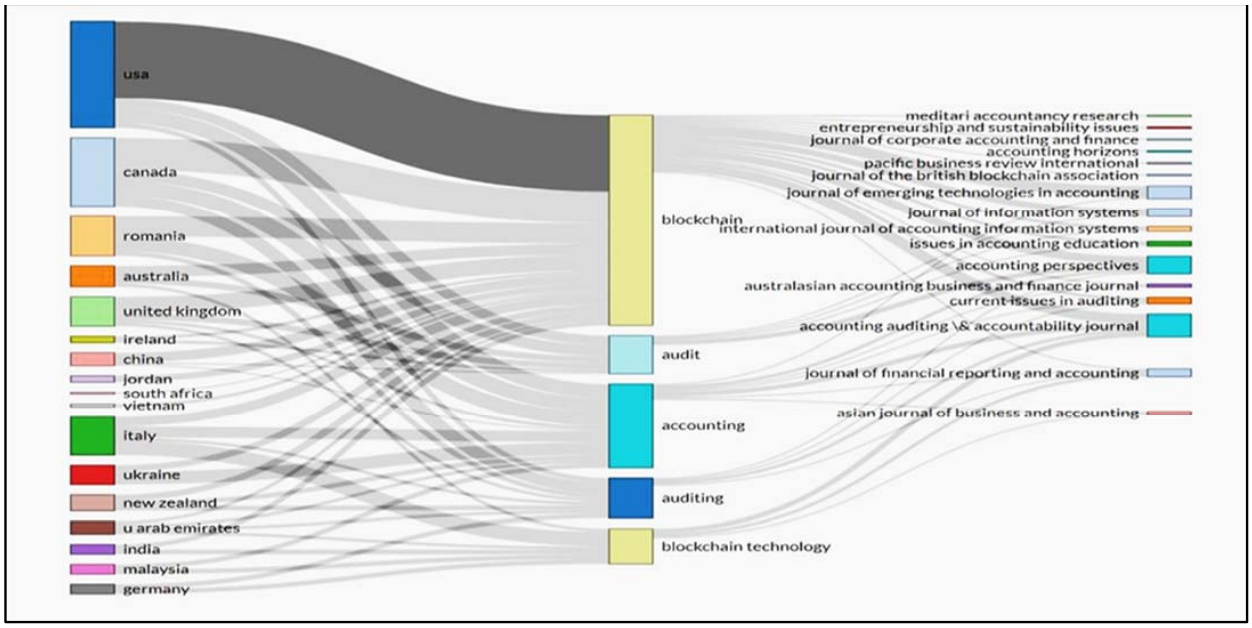

Figure 4. Three-field plot (country, keyword, and sources). Source: Biblioshiny R-package.

4.7. Co-Occurrence Network

The co-occurrence analysis presented in Figure 5 highlights the prominent keywords in scholarly discussions on the application of blockchain technology in accounting and auditing. These keywords, including blockchain, artificial intelligence, big data, accounting, audit, bitcoin, cryptocurrency, and smart contracts, have appeared frequently in academic publications, indicating their significance in the field. A comparison between Figures 3 and 4 further underscores the central role of these keywords in intellectual discourse and research. Both Figures 3 and 4 depict interconnections between countries, keywords, sources, and authors and show an overview of the primary research themes and sub-themes related to blockchain in accounting and auditing. Collectively, these findings suggest a focused and active academic pursuit in exploring the implications of blockchain technology in accounting and auditing practices.

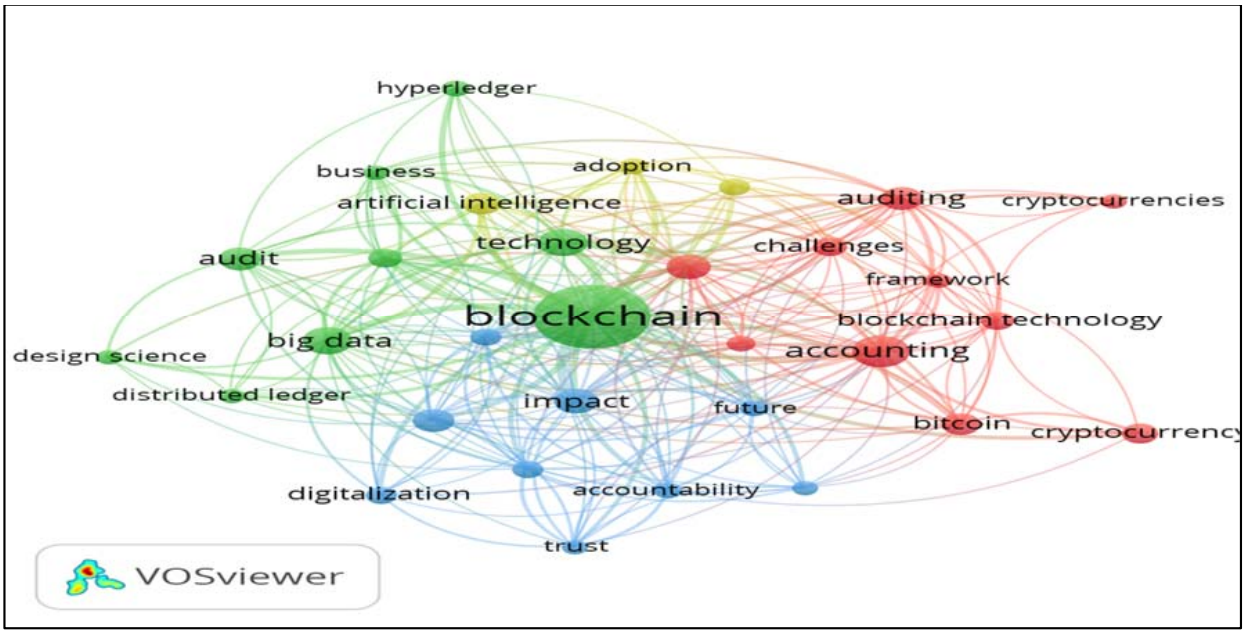

Figure 5. Co-occurrence analysis. Source: Vos Viewer.

4.8. Content Analysis

Figure 6 shows the bibliographic coupling output, which highlights five different nodes—red, green, blue, purple, and yellow. The authors read through in detail all the 24 articles shown in Figure 6 and compared them against the keyword network (co-occurrence analysis—Figure 5) and the three-field plots (Figures 3 and 4). Though Figure 6 uncovered five topics, detailed manual reading of the articles indicates an overlap between the clusters and suggests that the literature is fixated on three main themes: (1) the use of blockchain technology to strengthen financial reporting systems, (2) blockchain technology and the future of auditing, and (3) the valuation of cryptocurrencies. Nonetheless, all 67 papers were reviewed, and when they were pertinent, they were included in the subsequent discussion of the themes. The essence of the key themes is discussed below.

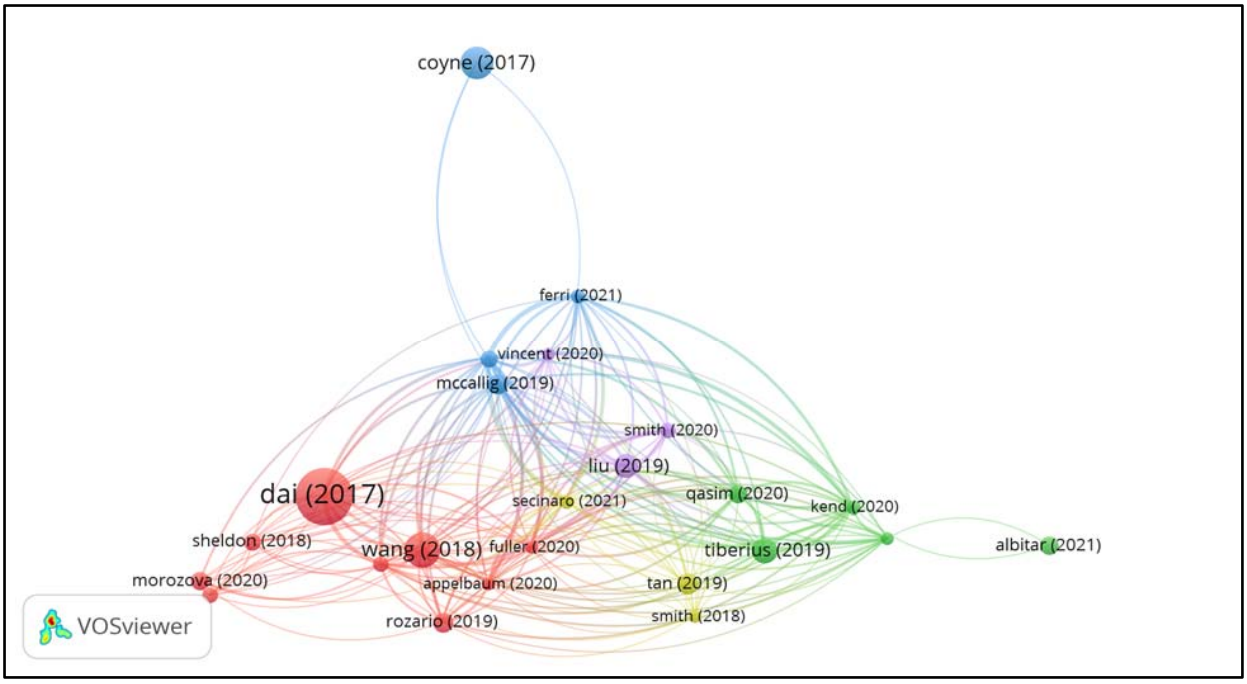

Figure 6. Bibliographic coupling network. Source: VosViewer. [4,14,22,34,39,66,96,97,99,100,104–111].

4.8.1. Theme 1: Blockchain Technology to Strengthen Financial Reporting Systems

Theme 1 largely examines the use of blockchain technology to enhance and strengthen financial reporting systems. The authors of [1,14,29,49,112] examined blockchain's capacity to facilitate a real-time, verifiable, and transparent accounting system and transform existing auditing systems and procedures. The integration of artificial intelligence, XBRL, and blockchain technology in managing financial statements was studied in [113]. Blockchain's applications in the automation of voluminous transactions, the minimization of data loss, and better tracking transactions were further studied in [13,114]. The authors of [34] replicated the findings through the development of a blockchain-based transaction processing system (BpTPS). The authors assert that the Bb-TPS employs the "zk-SNARK scheme" and "homomorphic encryption" techniques to consistently uphold privacy. To enhance the financial reporting system, the authors of [99] conducted a study investigating the utilization of public key cryptography, network analysis, public information and transparent systems, and open access indisputable storage. These findings should encourage accounting users to use blockchain technologies [97,110].

On the other hand, supporting [14,49,50,106,115,116] endorsed the fact that the unification of a lack of a central authority, the use of a distributed ledger, and the use of cryptography led many to describe the ledger as unalterable. These studies revealed that the immutable nature of the ledger generates several important advantages for users, such as ledger data protection against destruction or modification and the resilience of the stored

information against other forces, such as a natural disaster. Nevertheless, the authors were skeptical about the integration of blockchain into accounting, mainly due to risks linked with data security and privacy and the extent of the related costs. The authors of [39] examined how blockchain technology affects financial data integrity, reporting hazards, and corporate governance. The document provides guidance to both organizations and auditors, with particular emphasis on the significance of adjusting policies, assessing implementation risks, and carefully weighing the benefits and challenges of incorporating blockchain technology into external audits. The authors of [49] highlighted similar concerns. Their research contrasted blockchain-based transactions with economic transactions that occur outside of accounting records, suggesting that integration between these domains is questionable. The authors also suggested that incorporating blockchain technology into accounting and auditing requires balancing data privacy and openness.

Refs. [117,118] revealed that practitioners' interest in blockchain technology is predominantly in the areas of triple-entry bookkeeping, the immutability of transactions, the mechanization of routine tasks, the depiction of cryptocurrencies in financial statements, value-chain management, social and environmental auditing, and reporting and business model innovation. Additionally, the authors of [119–121] added to the discussion by investigating the incorporation of cost management, supply chain, and inventory management using blockchain technology and discussed the advantages and disputes. Ref. [16] further highlighted that public blockchains could be utilized by firms for voluntary information disclosure, leading to reduced disclosure errors, improved accounting information quality, and decreased information asymmetry. The authors of [19] developed a decentralized architecture rooted in blockchain technology, designing a proof of concept and modeling an accounting blockchain-based system.

In conclusion, relatively conclusive research has been undertaken on the eccentricities of blockchain technology application in accounting and the benefits it endeavors. Nevertheless, at this *blockchain adoption stage*, areas of interest could include the governance aspects of blockchain application, its risks, challenges, and issues related to continuous technological enhancement. Regulators and policymakers can gain insights into blockchain governance to develop frameworks that balance innovation, security, and compliance. A governed and secure blockchain ecosystem fosters trust and transparency, revolutionizing industries such as supply chain management, healthcare, and finance. Businesses can benefit greatly by understanding the risks and challenges associated with blockchain technology adoption, enabling decision making. Additionally, continuous research on technological enhancements empowers organizations to stay competitive by leveraging advancements in technology. Essentially, research in these areas not only enhances our understanding but also has significant implications for the socioeconomic landscape. Table 6 presents prospective research about the adoption and governance of blockchain technology and risks in blockchain and financial reporting alongside an examination of the continuous advancements in this field [122].

4.8.2. Theme 2: Blockchain Technology and the Future of Auditing

Theme 2 explores scholarly discussions on blockchain suitability in auditing practices. Ref. [96] documented that no major disruptive effects of applying blockchain in auditing are expected in the near future. Refs. [109,123] further explored the potential of blockchain and smart contracts to reengineer current audit procedures, thereby enabling Audit 4.0 and allowing auditors to verify accounting data through the two-party verification of transactions and conduct the audit on a more autonomous and continuous basis, i.e., an external audit blockchain that supports smart audit procedures. The authors of [105,124], echoed [125]; the authors of [35,126] examined the application of blockchain technology in auditing and inferred that the technology minimizes the tedious auditing process and increases the accuracy, efficiency, and reliability of the auditing process. This is further supported by the authors of [32], who examined and inferred that the unique features of blockchain technology are expected to impact the conduct of financial statement audits.

Comparably, using a decentralized and distributed immutable ledger (i.e., a blockchain), the authors of [111] proposed a blockchain framework, enabling CPA firms to access reliable audit evidence and client firms to preserve data privacy and protection. Studies were also undertaken on the use of blockchain, Internet of Things (IoT) [127], smart contracts, and artificial intelligence (AI) to effectively mitigate audit-related scandals [128]. Additionally, the authors of [105] stated that performance expectancy, social influence, and auditors' effort expectancy could also encourage auditors to adopt blockchain technology in auditing. The authors of [100] further examined the impact of COVID-19 on audit firms and the extent to which the pandemic played a role in these firms embracing and capitalizing on artificial intelligence, blockchain, cloud computing, and data/network security, hence enabling remote working. A recent study [129] discussed the challenges, risks, and new assurance prospects when auditing crypto assets. Ref. [104] addresses audit considerations such as data reliability, data security, transaction transparency, and contextual factors. Ref. [130] further examines the integration of algorithms in auditing and envisions a future scenario in which humans and algorithms work together as intelligent teams, proposing the concept of "Auditor-Governing-the-Loop." The authors of [116,131], further investigated the phenomenon of blockchain oracles and their influence on the dependability of data. Their proposition posits that oracles ought to be regarded as service organizations in accordance with auditing standards and delves into the attendant risks and control objectives that auditors should consider.

Table 6. Potential future research on blockchain technology to strengthen financial reporting systems.

Domain	Potential Future Research
Governance and regulatory obstacles	The utilization of blockchain technology in a decentralized setting poses governance and regulatory obstacles that require careful consideration. Future research could examine the existing governance structures and propose governance frameworks and regulatory guidelines that are tailored to the application of blockchain technology in the fields of accounting and auditing. Through a comparative analysis, the study could evaluate existing governance structures to ascertain their alignment with the decentralized nature of blockchain. The study could also investigate stakeholder perspectives, including regulators, industry professionals, and users, through surveys and interviews. This approach ensures a comprehensive understanding of the challenges and expectations related to regulatory compliance, providing valuable insights for the successful implementation of blockchain in the accounting and auditing domains.
Constant technical development	As blockchain technology continues to improve, future studies should concentrate on examining new developments and advances in the area. Potential research questions are (1) how can blockchain technology be integrated with emerging technologies like AI, IoT, or quantum computing to enhance accounting and auditing practices? (2) What are the potential synergies and challenges in the simultaneous development of blockchain technology alongside other disruptive technologies? (3) How can the continuous evolution of blockchain impact the scalability and security of accounting and auditing processes? A multi- disciplinary study exploring the integration of blockchain with AI, IoT, or quantum computing in accounting might provide insightful information about possible future opportunities and challenges.
Impact of blockchain on financial reporting	Potential research questions are (1) what are the specific technological aspects of blockchain that can enhance the reliability of financial reporting? (2) How can blockchain improve transparency in financial reporting, and what challenges may arise in the implementation process? Further research could examine the advantages and challenges of utilizing blockchain technology in financial reporting, considering technological, operational, and regulatory aspects, investigate the technological features of blockchain that contribute to the reliability of financial reporting, and assess the impact of blockchain on transparency in financial reporting. The research should aim to establish rules and best practices for leveraging blockchain to enhance the reliability, transparency, and efficiency of financial reporting procedures.
Blockchain-based triple- entry bookkeeping	The potential research questions are (1) how does the integration of a decentralized blockchain ledger impact the verification process in triple-entry bookkeeping? (2) What challenges may arise in reconciling traditional double-entry bookkeeping with blockchain-based triple-entry systems? (3) In what ways can triple-entry bookkeeping enhance the reliability and transparency of financial transactions? Future research could investigate the implications and challenges of integrating a decentralized and immutable blockchain ledger as a supplementary element to the traditional double-entry bookkeeping system. Additionally, research could evaluate the performance of triple-entry bookkeeping in terms of reliability and transparency.

To surmise, the discussion trend signals that blockchain technology's exclusive and distinctive characteristics [132] have encouraging impacts on auditing and the future direction moves more toward new technology applications in auditing [107] and the resulting risks and challenges. Table 7 highlights prospective research possibilities related to the use of new technologies in auditing and regulatory considerations, as well as the risks, challenges, and complications that they entail.

Table 7. Potential future research on blockchain technology and the future of auditing.

Domain	Potential Future Research
Regulatory and legal considerations	Potential research questions are (1) how do existing legal frameworks align with blockchain technology in auditing, especially considering compliance, data protection, and privacy laws? (2) What are the challenges and opportunities in using blockchain-based evidence for regulatory compliance in auditing? Future research could engage with stakeholders, including regulators, and conduct an in-depth analysis of existing legal frameworks to identify gaps and areas of alignment with blockchain in auditing. This includes focusing on compliance, data protection, audit regulations, privacy laws, confidentiality, and the use of blockchain-based evidence for regulatory compliance. Addressing these challenges will help navigate the legal and regulatory considerations of blockchain auditing.
Integration with existing audit practices	Potential research questions are (1) what are the key areas of synergy between blockchain technology and traditional audit practices? (2) How can practical guidelines be developed to facilitate the seamless integration of blockchain into existing audit processes? Using the case study methodology, future research could analyze successful integrations of blockchain technology with traditional audit practices and ultimately determine areas of synergy that could improve the effectiveness and efficiency of audits and identify practical guidelines and recommendations.
Data reliability and accuracy	Research question: What methods can be developed to enhance data integrity verification and fraud detection in blockchain-based auditing? To fully utilize blockchain technology in auditing, future research could collaborate with technologists to develop tools or algorithms for identifying deceptive practices or erroneous data on the blockchain. Research could also focus on identifying challenges, validating and ensuring the accuracy of data stored on the blockchain. A case methodology could be utilized to identify and rectify deceptive practices or erroneous data, ensuring data integrity verification and fraud detection to uphold audit integrity and trust.
Risk assessment and control considerations	Potential research questions: (1) What are the specific risks associated with auditing blockchain-based systems, and how can they be categorized and assessed? (2) How do blockchain-based systems impact internal controls, audit trails, and access management in auditing processes? (3) What frameworks can be developed to enhance internal controls, transparency, data integrity, fraud prevention, and access management in auditing blockchain-based systems? Future research could investigate and categorize risks associated with auditing blockchain-based systems and develop risk assessment frameworks tailored to the unique features of blockchain, investigate the impact of blockchain application on internal controls, audit trails, and access management in auditing processes, and develop guidelines for adapting and enhancing these elements to address new challenges. This could be achieved by collaborating with auditors, technology providers, and regulators to develop comprehensive frameworks for internal controls, transparency, data integrity, fraud prevention, and access management in blockchain-based auditing.
Blockchain-based audit evidence	Potential Research Questions: (1) How reliable is audit evidence derived from blockchain technology, to what extent is the audit evidence adequate in meeting the requirements of a thorough audit process, and what factors contribute to its reliability or lack thereof? (2) What frameworks can be developed to systematically assess the reliability and adequacy of audit evidence generated from blockchain transactions? (3) What challenges do auditors face in interpreting blockchain-based audit evidence, and how can these challenges be addressed to ensure accurate conclusions? Future research could analyze real-world cases to identify patterns and factors influencing reliability. Researchers could also collaborate with auditors, industry, and blockchain experts to design comprehensive frameworks for systematically assessing the reliability and adequacy of blockchain-based audit evidence. Additionally, survey-based research could be conducted with auditors to understand the challenges they face in interpreting blockchain-based audit evidence and identify areas of improvement.

4.9. Theme 3: Valuation of Cryptocurrencies

Cryptocurrency, as a digital form of money, has seen a significant surge in popularity and the emergence of initial coin offerings (ICOs). This has created a need to establish appropriate reporting standards for crypto assets and transactions. However, accounting for cryptocurrencies within the International Financial Reporting Standards (IFRS) framework is not clearly defined. The authors of [133] proposed a theoretical framework for accounting policies for cryptocurrencies which was based on neoliberalism and stewardship theories. They suggested using cost and fair value methods to account for Bitcoin, considering it a

"pseudo currency." Since Bitcoin does not fit the definition of a "currency" or a "financial instrument" within the IFRS framework, the application of IAS 21 is invalidated. This highlights the need for a systematic approach to classifying and evaluating crypto assets, as proposed by the authors of [101], who argued for the enhancement of existing standards or the introduction of a new IFRS [134] standard specifically for crypto asset valuation. Meanwhile, the Financial Accounting Standards Board (FASB) has proposed that certain cryptocurrency assets should be recorded at fair value, aligning with ASC 820, Fair Value Measurement 3. This amendment aims to provide a more accurate view of a firm's financial position by reflecting the fair value of cryptocurrencies in financial statements, benefiting all stakeholders.

The accounting treatment of cryptocurrencies has several difficulties principally stemming from their inherent volatility and speculative characteristics, limited marketability, and lack of a globally recognized value system [53]. The lack of precise accounting standards pertaining to cryptographic assets necessitates the adoption of a principles-based methodology, emphasizing the necessity of a methodical approach to categorizing and assessing crypto assets. In the current financial environment, properly recognizing and classifying cryptocurrencies in accounting poses a significant challenge [125]. To address this, businesses must carefully consider the use cases and goal of cryptocurrencies before deciding how best to account for these digital assets. Furthermore, in order to successfully negotiate this complexity, the accounting value of cryptocurrencies necessitates research, keeping up with new accounting standards, and seeking expert help. The process of auditing cryptocurrencies and blockchains necessitates a proactive methodology wherein internal auditors are tasked with evaluating an organization's present and intended utilization of cryptocurrency and blockchain technologies to guarantee the implementation of appropriate control measures [135].

Moving forward, prospective topics for further research (Table 8) in this area include examining tax consequences related to cryptocurrencies, disclosure requirements, regulatory frameworks, and the auditing of Bitcoin transactions [136]. These areas warrant in-depth investigation to address the unique challenges posed by cryptocurrencies in accounting and reporting practices. Overall, developing standardized accounting policies, valuation criteria, and regulatory frameworks specific to crypto assets is crucial to ensure transparent and accurate financial reporting in this evolving landscape.

Table 8. Valuation of cryptocurrencies.

Domain	Potential Future Research
Regulatory Frameworks	Potential research questions: (1) How effective are current valuation methods in accurately determining the fair value of cryptocurrencies, and what are their limitations in capturing the volatile nature of these assets? (2) What variations exist in cryptocurrency reporting practices across different jurisdictions, and how can a comparative analysis identify opportunities for harmonization? (3) How can the alignment between international and national standards in cryptocurrency reporting enhance compliance and simplify the reporting and auditing processes for entities dealing with cryptocurrencies? Future research could evaluate the effectiveness and limitations of current valuation methods for cryptocurrencies and investigate the alignment between international accounting standards (IFRS) and national frameworks for cryptocurrency reporting. A comparative analysis across jurisdictions can identify opportunities for harmonization, ensuring compliance and simplifying cryptocurrency reporting and auditing processes.
Auditing and Assurance	Potential Research Questions: (1) To what extent are the existing auditing frameworks, standards, and processes tailored to cryptocurrencies relevant, and what are the primary challenges associated with their application in the dynamic cryptocurrency landscape? (2) How effective are the internal controls, security measures, exchange platform reliability assessments, the sufficiency of cryptographic keys and wallets, and testing methodologies for blockchain transaction integrity in ensuring accurate financial reporting, risk mitigation, and stakeholder confidence in the cryptocurrency ecosystem? Future research could conduct a comprehensive analysis of existing cryptocurrency auditing frameworks, standards, and processes specific to cryptocurrencies and identify their relevance and challenges. A case study could be undertaken to assess the effectiveness, challenges faced by auditors, and emerging best practices of key auditing components specific to cryptocurrencies, such as internal controls, security measures, exchange platform reliability assessments, and cryptographic key and wallet sufficiency. Research could also evaluate their adaptability to the rapidly evolving nature of the cryptocurrency landscape, identifying gaps and areas for improvement.

Table 8. *Cont.*

Domain	Potential Future Research
Taxation Implications	Potential Research Questions: (1) What are the optimal tax treatments and regulations for the taxation of cryptocurrencies, taking into consideration the volatile nature of these assets and their implications for individual and business tax liabilities? (2) What are the primary challenges associated with ensuring tax compliance in the context of cryptocurrencies, and what innovative solutions can be proposed to address these challenges and promote fair and transparent taxation? Future research could concentrate on developing clear and comprehensive tax regulations for cryptocurrencies. This includes addressing challenges related to gains and losses treatment, tax reporting requirements, and ensuring tax compliance. This will enable individuals and businesses to fulfill their tax obligations accurately and promote fairness and transparency in the taxation of cryptocurrencies.

5. Conclusions

This study conducted bibliometric and content analyses of the application of blockchain technology within the domains of accounting and auditing. The results of the bibliometric and content analyses explicitly answered the research questions proposed in this study. The empirical results show an increasing trend in the number of publications, with several prominent authors, publishers, and documents. The *Journal of Emerging Technologies in Accounting* is the most cited journal, in addition to several other prominent ones, including three top accounting journals under the umbrella of the American Association of Accounting. Jun Dai and Miklos A. Vasarhelyi emerged as top authors in the area of blockchain technology in accounting and auditing with their publication titled "Toward Blockchain-Based Accounting and Assurance" published in the *Journal of Information Systems*. In terms of geographical location, the USA seems to have the highest number of publications in this domain. The bibliographic coupling and content analyses highlight three important themes: Theme 1, the use of blockchain technology to strengthen financial reporting systems; Theme 2, blockchain technology and the future of auditing; and Theme 3, the valuation of cryptocurrencies.

This study also demonstrated that blockchain technology has the potential to transform accounting and auditing practices by offering features such as transparency, immutability, security, and decentralization. The integration of triple-entry accounting can enhance the precision, reliability, and transparency of financial information while reducing the risk of malfeasance and instilling stakeholder confidence in financial reporting. The implementation of blockchain technology can automate repetitive accounting tasks, enabling professionals to focus on higher-level activities like aligning competitive intelligence with business strategy and decision making. It also streamlines the auditing process by providing real-time access to financial information, enhancing audit trail transparency, reducing costs and time, and ensuring reliable and tamper-proof evidence. The studies also suggested that blockchain technology can stimulate the emergence of new business models in the accounting and auditing industry, such as decentralized autonomous organizations (DAOs) which operate without intermediaries, resulting in cost reduction, increased efficiency, and improved transparency.

However, this review of the studies also acknowledges the challenges and limitations associated with the adoption of blockchain in accounting and auditing, including regulatory issues, privacy concerns, scalability, interoperability, and technical complexities [137]. To overcome these obstacles and realize blockchain's full potential in the accounting and auditing sectors, the regulatory community, legislators, industry leaders, and academics will need to work together and fully leverage the potential of blockchain technology. In conclusion, while some perceive blockchain more as a coding technology than an accounting technology [5], it is crucial for accountants and auditors to closely monitor rapid innovations in blockchain technology. Blockchain has the potential to reshape accounting procedures, practices, and processes, [55], and though it may be disruptive, its benefits are vast. Thus, further research is essential to understand and address the challenges associated with the adoption of blockchain in accounting and auditing and to harness its transformative potential while ensuring regulatory compliance and maintaining privacy and scalability.

As part of the significant contribution to the literature, this study identified potential future research directions under each theme (as discussed in depth in Section 4.7). The highlights of future research include (i) regulatory and governance aspects of blockchain application and its risks, challenges, and issues related to continuous technological enhancement; (ii) the investigation of new technology applications in auditing and the resulting risks and challenges; and (iii) examining the tax consequences related to cryptocurrencies, disclosure requirements, regulatory frameworks, and the auditing of Bitcoin transactions.

In conclusion, this research aspires to comprehensively explore existing scholarly discussions in the application of blockchain technology within accounting and auditing domains. The findings from this investigation are intended not only to contribute valuable insights into the ongoing academic discourse but also to highlight to all stakeholders the importance of the seamless integration of blockchain technology into accounting and auditing practices. As highlighted in [3,20], the envisioned outcomes include a heightened awareness of risks and challenges, the establishment of robust governance structures, and the formulation of effective frameworks. These collective efforts are anticipated to culminate in elevated transparency, heightened visibility, and overall efficiency within the domains of accounting and auditing.

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