

Tracing the Evolution of Blockchain in Accounting: A Bibliometric Analysis

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Abstract. Blockchain has emerged as a technology that will change the field of accounting. This technology offers unmatched transparency, security and efficiency in financial transactions and reporting. This research explores the potential of blockchain to revolutionize accounting practices, teaching in improving the accuracy, security and reflection of financial data. Using bibliometric analysis and PRISMA flow charts, this research analyzes trends and developments in blockchain research in the accounting field from 2019 to 2024. This research uses bibliometric analysis tools from R-Packages software and Biblioshiny WebInterface. This analysis is based on data from the Scopus database, identifying publication patterns, collaboration networks, and influential journals. This research uses the Technology-Organization-Environment (TOE) framework to understand the factors that influence the application of blockchain in accounting. By integrating bibliometric methods with the TOE framework, this research offers a detailed examination of blockchain's impact on accounting, as well as highlighting key areas for further research. These findings aim to support accounting professionals in effectively utilizing blockchain technology to improve operational efficiency and prevent fraud, as well as contribute to the wider adoption and integration of blockchain in the accounting field.

Keywords: Blockchain, Accounting, Bibliometric Analysis, Scopus, R-Packages, Biblioshiny, Publication Trends, Citations.

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Introduction

Blockchain is considered a highly influential technological development in various application fields, including finance, supply chain management, insurance, voting, healthcare, and government services (Akter et al., 2024). Blockchain has emerged as a revolutionary innovation in various fields, including the world of accounting. Accounting information systems (AIS), blockchain is the latest in a series of emerging technologies that are developing “elevated expectations” in the terminology of the Gartner Hype cycle which is a follow-up to analytical auditing, big data, XBRL, drones, expert systems, cloud computing, and so on (Alles & Business, 2023). As the technology underlying digital currencies such as Bitcoin, Ethereum, and others. Blockchain promises unprecedented transparency, security and robustness in financial bookkeeping and reporting. Blockchain as a tool for audit professionals to improve business information systems to save time and prevent fraud (Lombardi et al., 2021).

Blockchain is essentially a distributed ledger that records transactions in a chronological and decentralized manner. Blockchain technology produces data structures with inherent security qualities, based on the principles of cryptography, decentralization and consensus, which guarantee trust in transactions (Abad-segura & Infante-moro, 2024). Meaning that every transaction that occurs is monitored and verified by a broad network of users, not by a single entity. The security and integrity of data in a blockchain is provided by consensus achieved through sophisticated cryptographic algorithms, eliminating the need for authorities or intermediaries. In the accounting context, blockchain promises fundamental changes in the way financial data is processed, verified and reported. Lux and Petit (2021) in his research using the full source academic Business methodology database, the ABI/Inform and Emerald collections.

The research focuses on the benefits of blockchain and leaves its technical understanding to experts which is a good summary of the growing literature by accounting researchers on the use of blockchain to change accounting practices. Although blockchain technology has great potential to change accounting and auditing practices, the main problem faced is the low level of literature available regarding this technology in the accounting context (Rikhardsson, P., & Yigitbasiglu, 2018) (Yoshikuni et al., 2023).

This has led to a lack of in-depth understanding among accounting professionals about how blockchain can be implemented effectively. In addition, the lack of existing research makes it difficult for researchers to evaluate the benefits and challenges that may arise from using blockchain. The low level of literature also results in a lack of clear standards and guidelines, which are much needed to integrate this technology into daily accounting practices. Therefore, increasing the amount and quality of research on blockchain is necessary to provide better insights and help accountants and auditors make optimal use of this technology. This research seeks to answer an important question: Are accounting researchers familiar with research on blockchain?

Using bibliometric analysis and prism flow diagrams. This research was conducted to identify and understand trends and research developments related to the role of blockchain in the accounting field, especially during the 2019-2024 period. This period is particularly significant because it coincides with the emergence of the COVID-19 pandemic, which not only changed the way the world operates but also accelerated the adoption of technology in various sectors, including accounting. The 2019 COVID-19 pandemic prompted many organizations to turn to digital solutions to overcome operational challenges caused by social distancing and the need to work remotely. Blockchain, with its ability to increase transparency, security and efficiency, is one of the technologies that is gaining more attention during this period. Therefore, it is important to explore how blockchain-related research trends in accounting are developing during these critical times. By using bibliometric analysis on the Scopus database during the 2019-2024 period, this research aims to provide a comprehensive picture of how this topic is developing in scientific literature, especially amidst global challenges such as the pandemic. Bibliometric analysis enables the identification of research patterns, including the influence of authors, journals, and countries, as well as collaboration trends and research subjects of primary interest. In addition, the use of the PRISMA flow diagram in this research ensures that the study selection and screening process is carried out systematically and transparently, so that the results obtained have strong validity. Bibliometric analysis is a method that uses qualitative data from scientific publications to evaluate and map research fields. The bibliometric examination underscores specific inquiries and suggested considerations for researchers

at each phase (Dwianika et al., 2024). Bibliometrix a software package for bibliometric data analysis that provides various functions to measure impact and trends in scientific literature, this research will evaluate how blockchain is integrated in accounting practice. This analysis will identify publication patterns, such as the number of articles published, research topic trends, collaboration between researchers, and the most influential journals. Prisma Flow Diagram is a flow diagram used to describe the selection and inclusion process of research articles in a literature review. Prisma Flow Diagrams, on the other hand, can be used to visualize the process of literature collection and selection in bibliometric testing. This will help in displaying the steps involved in data collection, including searching, filtering, and assessing relevant articles.

This research will provide in-depth insight into the contribution and influence of blockchain in accounting and identify areas that require further research. Bibliometrix testing will provide an in-depth understanding of research trends related to the TOE Framework and similar programs, assisting in identifying the most discussed topics, the most commonly used methods, as well as developments in the literature over time. Combining the relationship between Technological Complexity Theory (TOE), bibliometric testing, and Prisma Flow Diagrams will make it possible to comprehensively analyze the interactions between technological, organizational, environmental factors, as well as related research trends in the context of evaluating or developing programs such as PRISMA.

Theoretical Background

Technological Complexity Theory (Technology - Organization - Environment Framework - TOE), emerged in response to the complexity involved in the adoption and implementation of technology in the business environment. Developed by Tornatzky and Fleischer in the 1990, this framework emerged from the awareness of the need to take into account, not only technological factors in adoption decisions, but also organizational and environmental factors that influence the process. Rapid changes in technology and increasingly complex business dynamics have made researchers and practitioners aware of the importance of viewing technology adoption as a phenomenon influenced by a number of internal and

external factors. The TOE framework mapped closely to the important influencing factors identified by the literature review (Seshadrinathan & Chandra, 2021). TOE Framework that covers technology and organization and integrates human and security factors to complete a framework that identifies the impact of blockchain adoption (Lu et al., 2024). The TOE Framework, which combines three major perspectives – technological, organizational, and environmental – is a rich conceptual framework for analyzing technology adoption and implementation in the context of accounting firms. By paying attention to the complex interactions between technological factors, organizational structure, and external environmental conditions, the TOE Framework provides deep insight into how technology adoption decisions are made, as well as the factors that influence the success or failure of blockchain implementation in accounting practice. With a holistic approach, the TOE Framework allows researchers to understand the complex dynamics involved in implementing blockchain technology in accounting firms and identify the most effective strategies for overcoming emerging challenges.

Bibliometric analysis and Prisma Flow Diagrams, will explore the integration of blockchain in accounting practice and identify patterns of publication and collaboration between researchers. This research will provide in-depth insight into the contribution of blockchain in accounting and identify areas that require further research. The integration of TOE, bibliometric testing, and Prisma Flow Diagrams enables comprehensive analysis of the interactions between technological, organizational, environmental factors, as well as research trends.

Research Methods

This research uses qualitative methods to investigate trends and developments (Singh, S. and Dhir, 2019), in the study of the role of blockchain in the field of accounting. This research uses bibliometric analysis and content analysis sourced from the Scopus database (Rahman & Kebijakan, 2023). This research exclusively uses the Scopus database as a data source for several compelling reasons. Scopus is one of the world's largest and most reputable academic databases, covering a wide range of scientific disciplines, including accounting and technology. This database is widely known for the high quality of the journals indexed in it, which have undergone a rigorous peer-review process. By using Scopus, researchers can ensure that the data used

comes from credible and internationally recognized sources, which is important for validity and reflects the research results. Journals are indexed in Scopus based on their quality into four quartiles, namely Q1, Q2, Q3, and Q4. These quartiles indicate a journal's position in the distribution of quality in its field:

- Q1 (Quartile 1) includes the top 25% of journals recognized as having the highest influence and reputation.
- Q2 (Quartile 2) includes journals that are in the top 25% to 50%, indicating excellent quality.
- Q3 (Quartile 3) includes journals that fall between the top 50% and 75%.
- Q4 (Quartile 4) includes journals that are in the bottom 25% in terms of influence.

Thus, the use of Scopus as a data source not only ensures access to high-quality literature but also allows researchers to focus on journals that have significant influence in their field, especially those in the top quartile. This is very important to produce valid and relevant analysis in reviewing research developments related to blockchain in accounting. Data analysis and visualization was carried out using bibliometric analysis techniques utilizing R-Packages software and Biblioshiny WebInterface (Ulfatun Naili Nadhiroh, 2023). There are five main steps that we implemented in this research. First, determine keywords that are relevant to the research topic, with a focus on blockchain and accounting. Second, search for data according to predetermined keywords, limiting the publication period from 2019 to 2024. Third, select articles that match the predetermined criteria. Fourth, validate the data to ensure the quality and accuracy of the information used in the research. articles.

And fifth, carry out data analysis by identifying trends, patterns and other important aspects that emerge from the data that has been collected. This approach can provide a better understanding of how research on blockchain in the accounting context is developing, as well as identify important areas that require further attention in the future. The Prisma Flow Diagram was prepared to visualize the article selection process from the initial search stage to the final filtering stage. This chart includes the number of articles found, the number of articles screened at each stage, and the reasons for article rejection. The Prisma Flow Diagram is also equipped with a narrative or short description that explains the article selection process.

Following the procedures of SLR (Tranfield et al., 2003), defining the search queries for a keyword search in the WoS and Scopus databases and chose these databases based on their data download capabilities (Moral-muñoz et al., 2020). Data obtained from Scopus with the initial keyword "Blokchane AND Accounting" totaling 881 data. So the research question can be taken: Are accounting researchers familiar with research on blockchain?

This research will analyze whether accounting researchers are familiar with research on blockchain through the prism of flow diagrams and bibliometric analysis. This diagram shows how important a thorough and methodical selection process is in systematic research to ensure the reliability and validity of research findings. This PRISMA flow diagram illustrates the journal selection process used in systematic research from the Scopus database. This process began with initial identification, where a search in the Scopus database yielded 881 journal

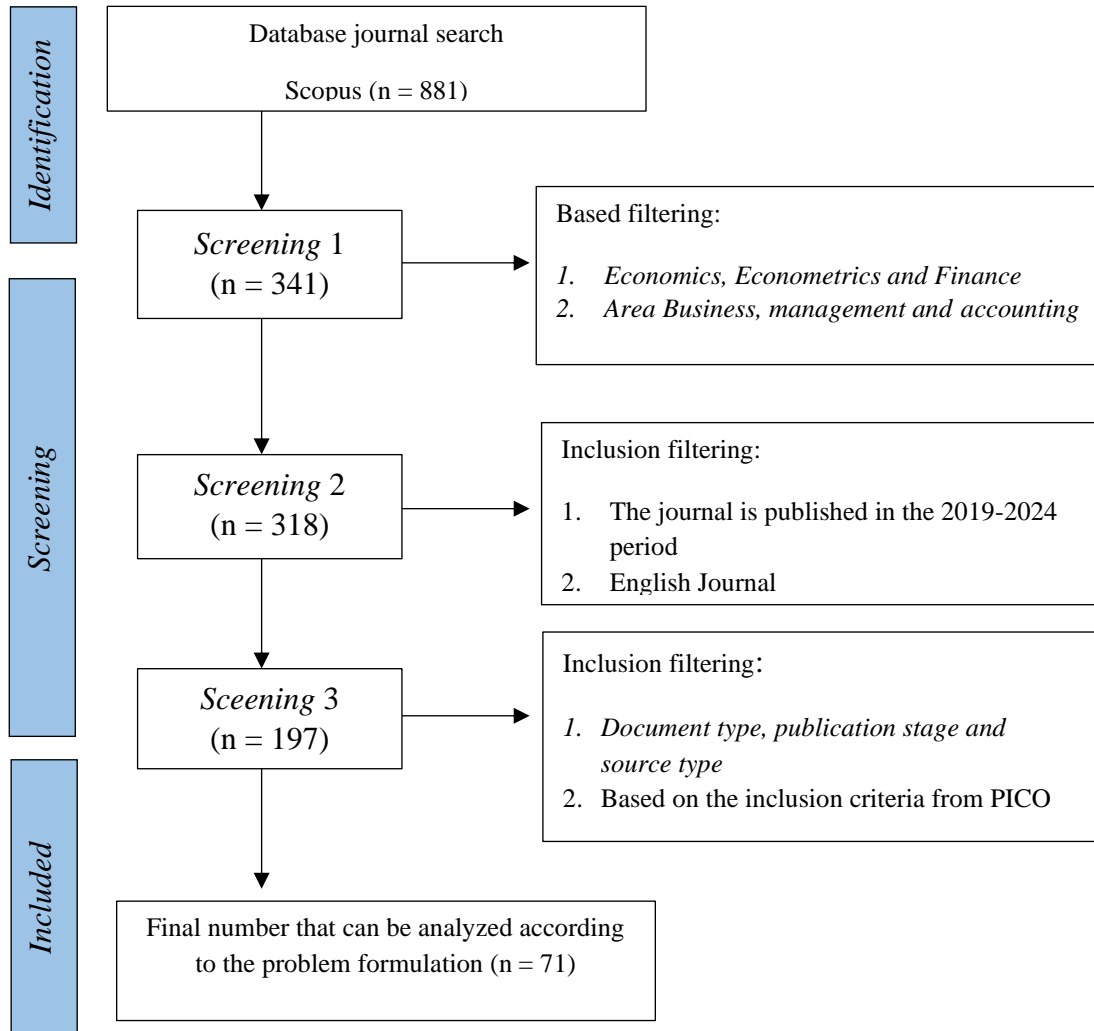


Fig. 1 PRISMA Flow Diagram
Source: Research Analysis

The PRISMA flow diagram in figure 1 depicts the process of selecting journals used in systematic research from the Scopus database. This process began with initial identification, where a search in the Scopus database yielded 881 journal articles. In the first stage of screening, these articles were screened based on relevance to the fields of economics, econometrics, finance, business, management, and accounting. This initial screening reduced the number of articles to 341, eliminating those that did not fit the research focus. The second stage of filtering was carried out to ensure that only articles published in the 2019-2024 time period and written in English were included in further analysis. After this second screening, the number of articles was reduced to 318. This indicates that this additional screening aimed to ensure that only current and accessible articles were considered, ensuring temporal and linguistic relevance.

Next, the third stage of screening was carried out with stricter inclusion criteria. These articles were assessed based on document type, stage of publication, and source type to ensure that only articles with certain quality standards were included. In addition, PICO (Population, Intervention, Comparison, Outcome) criteria were used to further reduce the number of irrelevant articles. This filtering further reduced the number of articles to 197, removing those that did not meet certain standards of quality and relevance.

Finally, after all stages of filtering and assessment, the number of articles that could be analyzed according to the research problem formulation was reduced to 71 articles. These articles were selected based on a series of strict and systematic criteria, aimed at ensuring that only the most relevant and high-quality articles were included in the final analysis. This diagram shows how important a thorough and methodical selection process is in systematic research to ensure the reliability and validity of research findings. Through these structured steps, researchers can guarantee that the final research results are based on strong and relevant evidence, which supports better decision making and a deeper understanding of the topic under study.

Results And Discussion

The growth of journal publications in 2019-2024 changes every year. 71 documents were analyzed originating from 48 different sources such as journals and books. In table 1 you can see the growth of journal publications.

Table 1
Main Information

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2019:2024
Sources (Journals, Books, etc)	48
Documents	71
Annual Growth Rate %	-4,36
Document Average Age	2,28
Average citations per doc	20,99
References	4180
DOCUMENT CONTENTS	
Keywords Plus (ID)	25
Author's Keywords (DE)	224
AUTHORS	
Authors	184
Authors of single-authored docs	10
AUTHORS COLLABORATION	
Single-authored docs	10
Co-Authors per Doc	2,72
International co-authorships %	28,17
DOCUMENT TYPES	
article	71

Source: R-Packages dan WebInterface Biblioshiny

Table 1 provides an overview the annual growth rate of this document decreased by 4.36%. The average age of the documents was 2.28 years with an average of 20.99 citations per document, indicating that these documents are quite new and have received attention in the literature. Overall, there are 4180 references cited in all documents. In terms of content, there are 25 additional keywords identified by the system and 224 keywords assigned by the author. In terms of authors, there were a total of 184 authors involved with 10 of them writing single documents. There were an average of 2.72 authors per document, indicating quite high collaboration among authors. The percentage of international collaboration among authors was 28.17%, indicating that more than a quarter of the documents involved authors from different countries. All documents analyzed were articles, with a total of 71 articles used as the basis for analysis in this study. This information provides in-depth insight into the characteristics of the documents and the author's collaboration in the research conducted.

Table 2
Graphics Annual Scientific Production

Year	Articles
2019	10
2020	5
2021	15
2022	14
2023	19
2024	8

Source: R-Packages dan WebInterface Biblioshiny

During the period 2019 to 2024, there are fluctuations in the number of scientific articles published each year. Table 1 data shows growth trends and fluctuations in research activity over eight years, with a peak in high production in 2023.

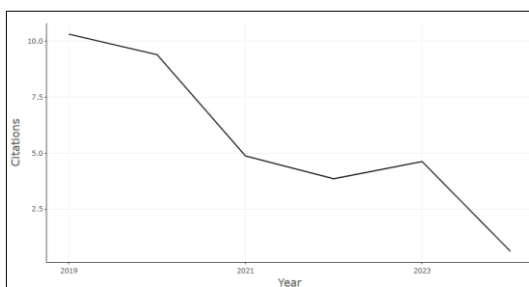


Fig. 2. Citations Trend

Source: R-Packages dan WebInterface Biblioshiny

Table 3
Citations Trend

Year	Mean TC per Art	N	Mean TC per Year	Citable Years
2019	61,90	10	10,32	6
2020	47,00	5	9,40	5
2021	19,53	15	4,88	4
2022	11,57	14	3,86	3
2023	9,26	19	4,63	2
2024	0,62	8	0,62	1

Source: R-Packages dan WebInterface Biblioshiny

Figure II describes a consistent decline in average Total Citations (TC) per article and per year from 2019 to 2024. Although the number of articles (N) varies from year to year, the average TC per article decreased from 61.90 in 2019 to only 0.62 in 2024. This indicates a potential decline in interest or relevance of research topics from year to year. In addition, the number of years that can be cited (CitableYears) has also

decreased significantly, from 6 years in 2019 to only 1 year in 2024. This indicates a possible decline in the availability of relevant literature or recognition of research conducted in that period.

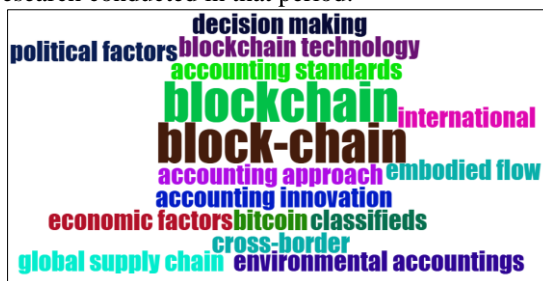


Fig. 3. Word Cloud

Source: R-Packages dan WebInterface Biblioshiny

This word cloud provides a visual depiction of the most frequently discussed topics and themes in literature. Larger words indicate key focus areas, such as “blockchain,” “accounting standards,” and “blockchain technology.” From this word cloud, it can be concluded that research on blockchain in accounting focuses on the application of blockchain technology, its impact on accounting standards and methods, as well as external factors influencing its adoption.

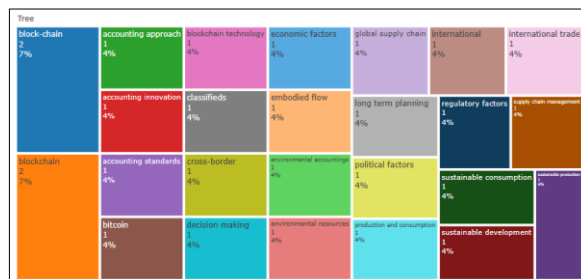


Fig. 4. Word Tree Map

Source: R-Packages dan WebInterface Biblioshiny

The Word Tree Map provides a clear visualization of the various topics and themes discussed in the literature related to blockchain in accounting. Topics such as “blockchain,” “block-chain,” and “accounting approaches” stand out as key focuses. The keywords “block-chain” and “blockchain” appear twice each, each accounting for 7% of the total keyword occurrences. By analyzing this Word Tree Map, researchers can identify the areas that have been most researched, as well as uncover areas that have received less attention and require further research.

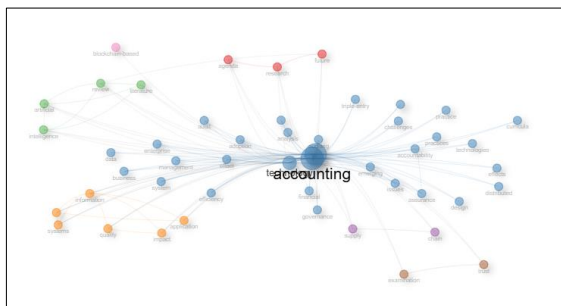


Fig. 5. Co-occurrence Network
Source: R-Packages dan WebInterface Biblioshiny

Co-occurrence Network helps identify key themes and relationships between various topics in the literature as well as providing insight into research trends. Each node or point in the network represents a particular keyword, and the lines connecting the nodes indicate that the keywords frequently appear together in the same literature. The size of the nodes reflects the frequency with which the keywords appear, while the thickness of the lines indicates how often the keywords appear together. The keyword “accounting” is at the center of the network, indicating that accounting is the main theme. The association with keywords such as “audit,” “adoption,” and “analysis” indicates a primary focus on specific aspects of blockchain application in accounting.

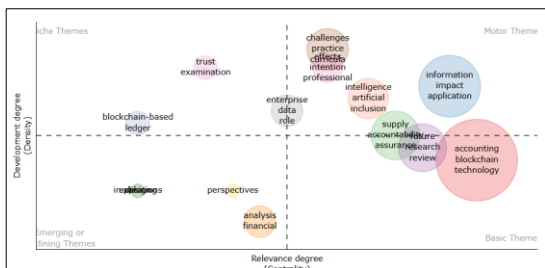


Fig. 6. Thematic Map
Source: R-Packages dan WebInterface Biblioshiny

The image explains a conceptual framework diagram that visualizes the themes and sub-themes of a topic related to blockchain technology in accounting. This diagram consists of various bubbles, each representing a different theme such as “Motor Theme”, “Basic Theme”, and “Emerging Themes”. These bubbles are connected by lines to sub-themes such as “impact application information”, “accounting blockchain technology”, and “financial challenges”. The size of the bubble may indicate the level of relevance or development, with larger bubbles indicating importance or a more developed area of

research. The colors from green to red depict different stages or levels of development of the theme. This type of map is interesting because it provides a visual representation of the complex relationships between concepts and can help understand how different aspects of a topic are connected.

Conclusions

This research highlights the immense potential of blockchain technology in revolutionizing the field of accounting by offering unmatched transparency, security and efficiency. Through bibliometric analysis and application of the Technology-Organization-Environment (TOE) framework, this study uncovers trends and developments in blockchain research in accounting over the period 2019 to 2024. Findings show that despite high enthusiasm for blockchain, there are still significant gaps in the literature that hinder implementation practical. International collaboration has played an important role in this research, but more comprehensive studies are needed to develop clear guidelines and standards that can be adopted by accounting professionals. Therefore, increasing the amount and quality of research in this area is essential to ensure that blockchain technology can be effectively integrated into daily accounting practices, improving operational efficiency and preventing fraud.

This study has several limitations that need to be noted. First, this analysis only covers the period 2019 to 2024, so it cannot provide a complete picture of the development of blockchain research in accounting before or after that period. Second, the data used only comes from the Scopus database, so there may be other relevant research that was not captured. Third, although bibliometric analysis provides insight into publication trends and patterns, it is not in-depth in terms of contextual understanding of the individual studies involved. Lastly, limitations in the keyword selection methodology and article filters may influence the final results and generalizability of the findings.

Based on the findings and limitations of this study, there are several recommendations for future research. Further research should cover a longer period of time to gain a more comprehensive picture of the development and impact of blockchain in accounting. Conduct case studies on companies that have implemented blockchain in their accounting systems to evaluate the real impact and identify best practices.

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