

One Decade AIS Professionals in a View of Blockchain Technology Development: A Bibliometric Analysis

Egi Rahmansyah*, Fitri Amalia

Faculty of Economics and Business, Gadjah Mada University, Yogyakarta, Indonesia

Abstract

This study aims to see how the development of research on dynamic capabilities of accounting information system (AIS) professionals using blockchain technology is growing in the accounting world, requiring AIS professionals to meet the needs of these capability demands. However, at present, few studies have conducted a synthesis of research on the dynamic capabilities of AIS on blockchain technology. The results of this study can see the structure of future research and research trends. This research uses bibliometric analysis of the dynamic capabilities of AIS professionals in the development of blockchain technology. One hundred four articles were published on the Scopus database in 2015-2024. Using workflow and thematic evolution, citations, co-citations, and social networks, this research uses Biblioshiny R Studio in ScimagoJR-indexed journals, countries, authors, keywords, and affiliations. The results showed an increase in research in the field of blockchain technology. A significant increase occurred in 2021 and 2024. The USA, followed by the UK, is the most researched contributor on blockchain and citations. Articles in this field are published in the Journal of Emerging Technologies in Accounting, followed by the Journal of Information Systems. Further on, there is a discussion of conceptual, social, and intellectual structure. The results of this study provide direction for future research on blockchain technology in accounting. The limitations of the research lie in the limitations of using keywords in searching the Scopus database and using only one database without considering the Web of Science and others. This research contributes to practice so that it continues to work together in other fields of knowledge, such as information systems, to create dynamic capabilities and sustainable competencies for AIS professionals.

Keywords: Blockchain, AIS professionals, bibliometrics

1. INTRODUCTION

This research aims to synthesize future research on the dynamic capability of accounting information system (AIS) professionals in the development of blockchain technology. Initially, the role of accountants was limited to manually recording financial statements in books until it developed into an automated, multi-service, interconnected, and easily accessible input process. Initially, blockchain technology was used as a cryptocurrency flow, but it has developed as an innovation that is an opportunity in various industries (Akram et al., 2020). As the technology evolves, the demands on AIS professionals require them to expand their domain of knowledge and competence towards the development of blockchain technology (Kroon et al., 2021; Qasim & Kharbat, 2020; Tiron-Tudor et al., 2021). Furthermore, blockchain technology makes AIS professionals' tasks more complex; big data, data processing, and information are interrelated, which directs the knowledge of AIS professionals to understand the concept of how blockchain works. Hence, the strategic importance of blockchain technology is to improve operational efficiency and competitiveness in companies (Al-Dmour et al., 2024).

Currently, many studies discuss the relationship between accounting and blockchain technology. Such as research conducted by (Han et al., 2023) discussing technology auditing (Cai, 2021), triple-entry accounting using blockchain, blockchain as a supply chain (Xu et al., 2021), and blockchain as carbon emission security (He et al., 2024), etc. Blockchain technology was estimated to be used in the accounting profession as early as 2015. (Lazanis, 2015). However, there still needs to be more research on a systematic literature review that discusses

*Corresponding author. Tel.: +6282195971759
E-mail: egirahmansyah1402@gmail.com

the trend of dynamic capability of AIS professionals on the blockchain. Therefore, this study will synthesize the research trends of dynamic capability AIS professionals on the development of blockchain technology to assist researchers in synthesizing and assisting future research. This research explores journal articles on dynamic capability AIS professionals' trends in blockchain technology published in the Scopus database from 2015 to 2024 by evaluating country, organization, Author, Journal, authorship patterns, collaborative networks, three-factor analysis, keywords analysis, and global collaborative patterns. The bibliometric analysis method is used to decipher fragmented journal articles by finding underlying patterns in terms of conceptual, intellectual, and social structures.

1.1 Paper

To answer the research gap, this research conducts a bibliometric analysis of the dynamics of AIS professional capabilities related to the development of blockchain technology used in the field of accounting science in business and government. Therefore, it is necessary to conduct literature analysis through important journals, countries, authors, keywords, thematic evolution, citations, co-citations, and social network analysis; the results of this research literature will provide future research directions related to the dynamic capability of AIS professionals on blockchain technology. This article is organized in several sessions. The first session discusses the concept of dynamic capability of AIS professionals and blockchain, research questions on relevant journal articles; the next session discusses the methodology of selecting a database of journal articles for bibliometric analysis, descriptive analysis, and research results, and finally, conclusions, research limitations, and future research.

1.2 Bibliometric analysis

Bibliometric analysis investigates and maps the literature published in journals. The basic concept of bibliometric analysis explains patterns in the literature using mathematical and statistical methods. (Aria & Cuccurullo, 2017; Pendse et al., 2023; Singh & Dhir, 2019). Currently, research conducted by (Garanina et al., 2022; Lardo et al., 2022) discusses literature review content analysis and bibliometric analysis. However, bibliometric research was conducted by (Lardo et al., 2022). Only discusses blockchain domain trends used in accounting, and the observation year is up to 2020. Therefore, this research will develop from previous research, using the observation year 2015-2024 and questions that have not been explained in the previous literature.

1.3 Research questions and objectives

To fulfill the bibliometric analysis, the researchers formulated the following questions:

RQ1: What are the publication trends related to dynamic capability AIS on blockchain technology in 2015-2024?

RQ2: What journals publish a lot on AIS professionals' dynamic capabilities in blockchain technology?

RQ3: What countries, organizations, and authors are most researching accounting blockchain technology?

RQ4: What keywords are often used in the research on AIS dynamic capability on blockchain technology?

The main objective of this study is to analyze research publications on the dynamic capability of AIS professionals to develop blockchain technology indexed in the Scopus database and describe trends and patterns in the knowledge structure to obtain a synthesis of knowledge presented in tabular and visual form.

2. RESEARCH METHODOLOGY

This phase will find and select suitable databases for the data that will enter the next stage, namely the analysis stage. Inclusion and exclusion criteria are used to find the right journal articles and keywords. After that, data analysis will be carried out using R Studio Software. In the first stage, researchers will conduct a descriptive analysis of the data obtained in the Scopus database based on information about authors, sources, countries, and documents. Next, a network map will be created to create better data visualization so that it is easier to understand the data's conceptual, intellectual, and social structure (Aria & Cuccurullo, 2017). This article is developed from research (Lardo et al., 2022) that discusses blockchain technology used in accounting.

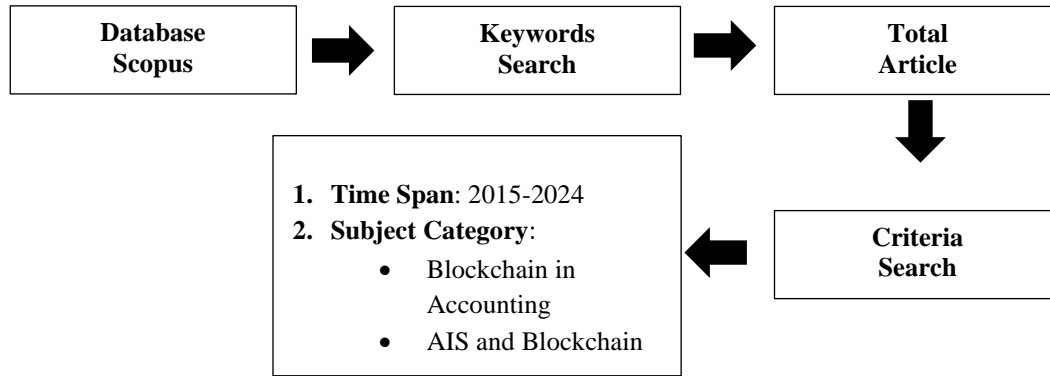


Figure 1. Diagram of document selection for bibliometric analysis.

3. Database selection

The use of bibliometric analysis centers on examining the structural composition of articles and scrutinizing their bibliographies and other relevant information. This analysis leverages the Scopus database to extract articles published in reputable journals, which are then subjected to in-depth examination using R studio software.

2.2 Preparing data for analysis preparation.

This research uses the R Studio bibliophily tool, extracting from the Scopus database using CSV format. Here are the specifications.

1. Data taken from 2015 to June 24, 2024
2. Document type: Articles published in journals in the Scopus database
3. The keywords used were "Knowledge of AIS towards blockchain", and "Expertise of AIS towards blockchain", "blockchain technology in accounting". 114 article documents were extracted from the Scopus database with keywords limited to the keyword "blockchain".
4. The scientific domain is limited to "Business, Management, and Accounting."
5. Document search is limited to "article title, abstract, keywords, authors, reference, and affiliation countries".
6. All language used in articles published in journals is used.
7. Time 2015-2024. However, when checking the article documents, the vulnerable years 2015-2016 did not have relevant articles to be studied, so the data was available from 2017-2024.

4. Data Analysis and Results

Descriptive and network analysis are the two types of data analysis used in this study.

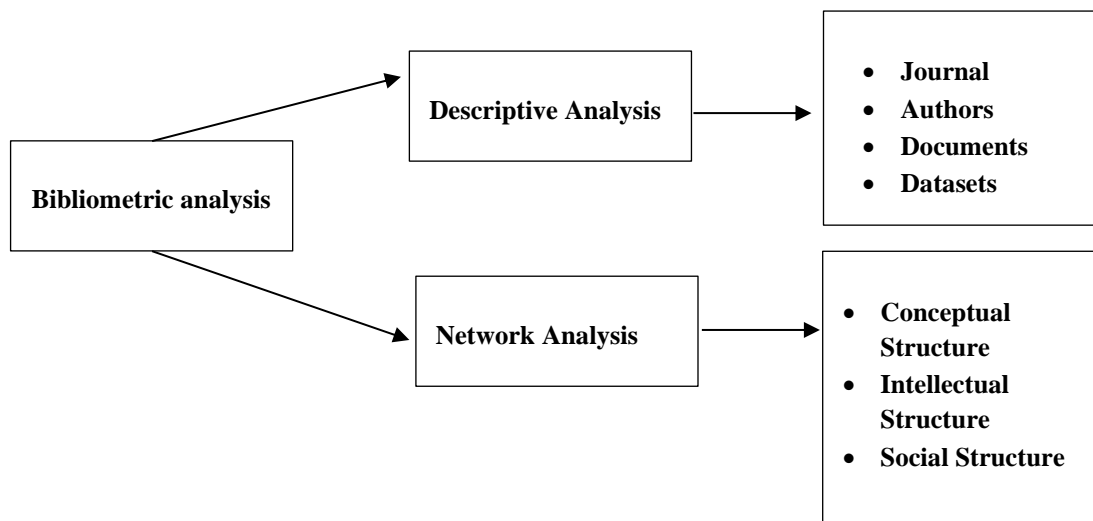


Figure 2. Levels in bibliometric analysis

3.1 Descriptive analysis

The descriptive analysis discussion session is divided into several dimensions used in this analysis.

3.1.1 Three field plots

Three field plots or Sankey plots are utilized to visualize the relationships between three field plots. Sankey diagrams are employed to facilitate visualization techniques, enabling the identification of flow and meaningful relationships that align with our objectives as illustrated in Figure 3.

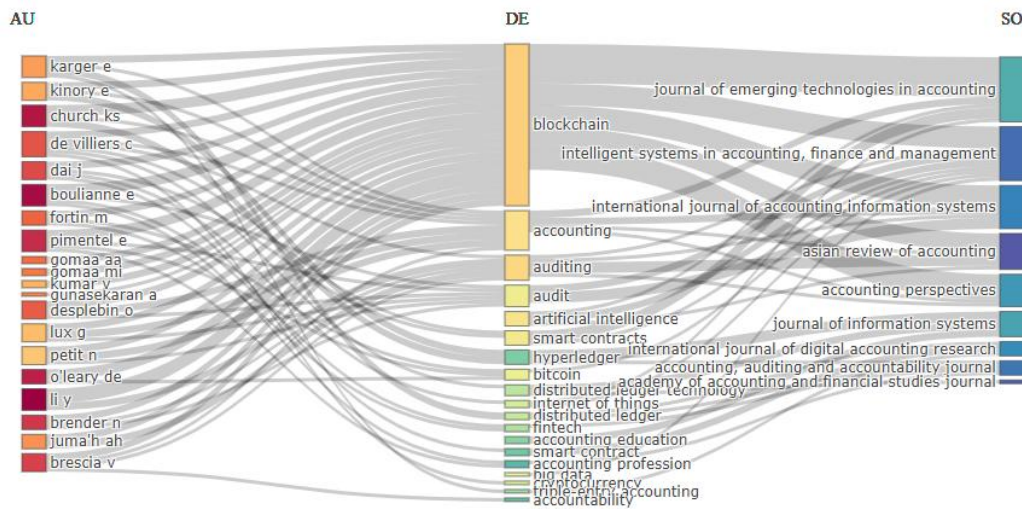


Figure 3. Three field plots

In the three plots image visualization, three main points are displayed in the analysis. Researchers took the top 10 fields in the three plots' data. On the right, displaying the author, in the middle of the keywords used, the keywords most used by the author are "blockchain", "accounting", "auditing", "artificial intelligence", and "smart contracts". The right side displays the top 10 journals that publish the most blockchain-related articles related to the accounting field.

3.1.2 Annual scientific production

Annual scientific production visualizes the quantity of published research based on research trends. We took data from 2015-2024. However, data is available on the Scopus database from 2017 to 2024; visualization data is available in Figure 4. Based on visualization data, blockchain publications grew from 2020 to 2024. the highest publication year in 2023 was 24 articles; researchers believe that research on blockchain in the field of accounting will grow every year because blockchain is a system that guarantees security and preservation.

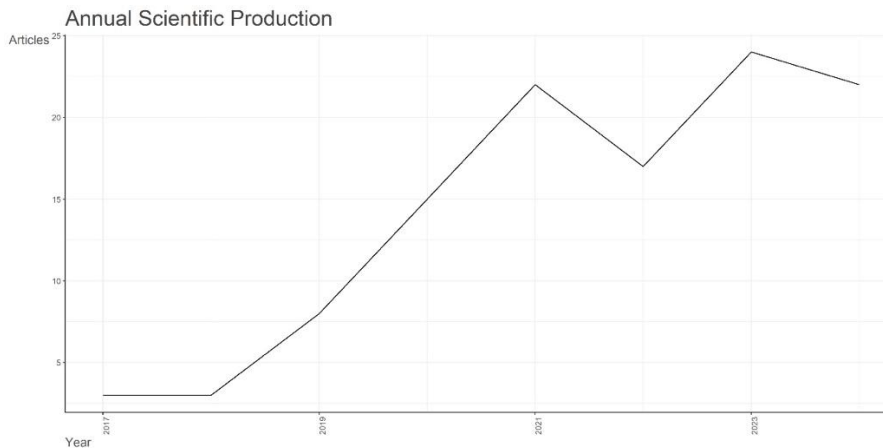


Figure 4. Annual scientific production

3.1.3 Average citations

Based on Figure 5, the highest average citation was shown in 2017, as much as 33%, then followed by 2021, as much as 21%. In 2017, the use of blockchain technology in accounting science began, so a lot of literature was used as the basis for further research or citations.

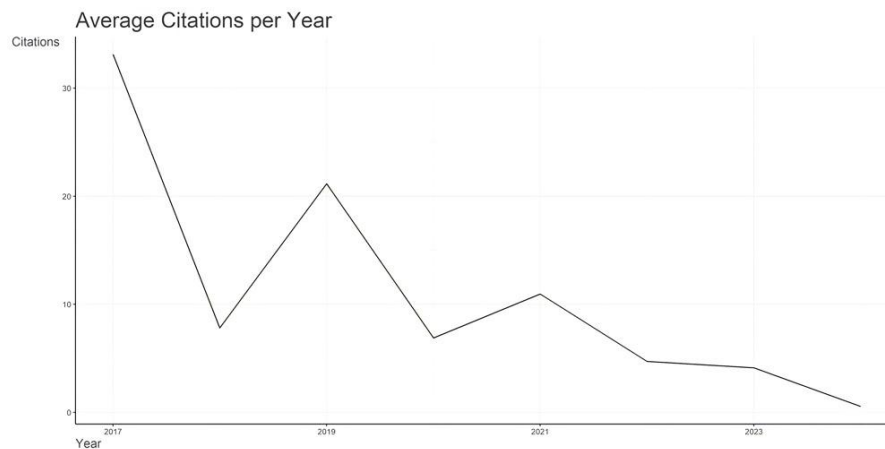


Figure 5. Average citations per year

3.1.4 Most relevant sources

Based on Figure 6, the most relevant sources. The top 10 journals that published articles based on the theme of blockchain in accounting. Journal of Emerging Technologies in Accounting, followed by Journal of Information Systems and Accounting Perspectives. This indicates that information systems already use blockchain technology in the field of accounting.

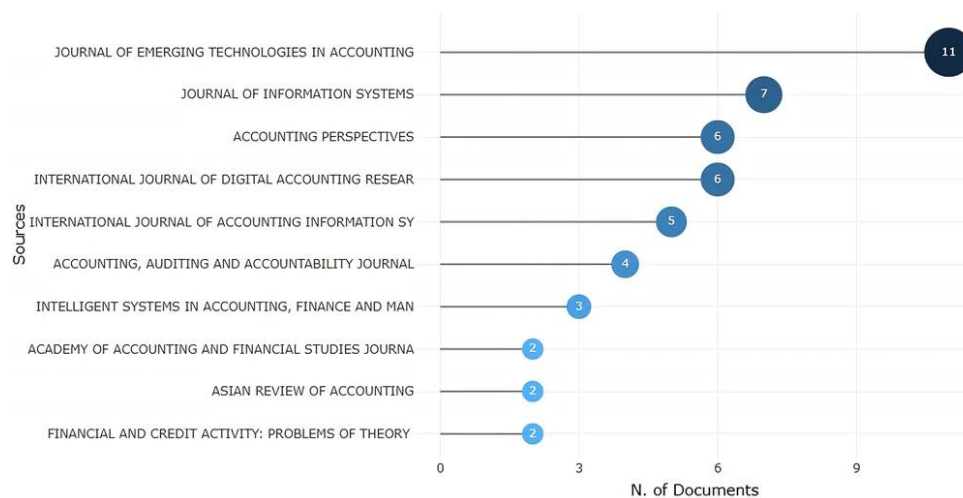


Figure 6. Most relevant Sources

3.1.5 Most relevant authors

The results of Figure 7 show that Li Y, Boulianne E, and Church KS are the most productive authors who write and publish related to the field under study. Meanwhile, based on the author's impact in Figure 8. The author with the highest impact is Boulianne E, followed by Church KS and O'Leary DE. It can be said that the results of their research impact the world of academia; their research can be considered an important field to be developed in future research.

3.1.6 Countries contribution

Figure 9 shows that of the many countries contributing to the literature in this field, the data shows that the USA produces the most literature, followed by the United Kingdom and Italy. These show that developed countries have high productivity in contributing literature and actively researching this field. Then figure 10 shows that the country with the most cited literature is the USA, with 1052 citations, followed by the United Kingdom, 895, and

Australia, 211 citations. The cited literature indicates that the literature impacts the development of blockchain technology.



Figure 7. Most relevant Author

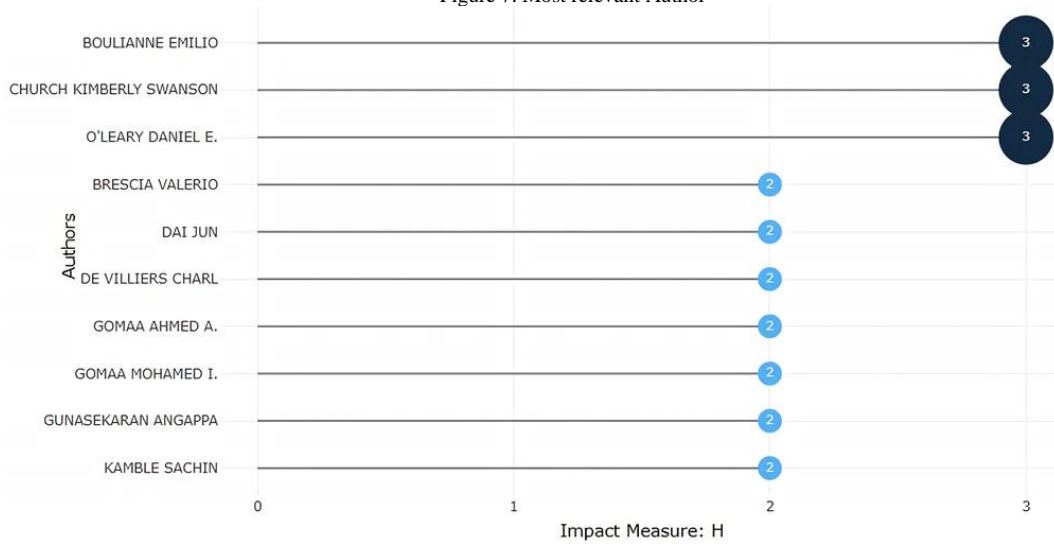


Figure 8. Author's impact

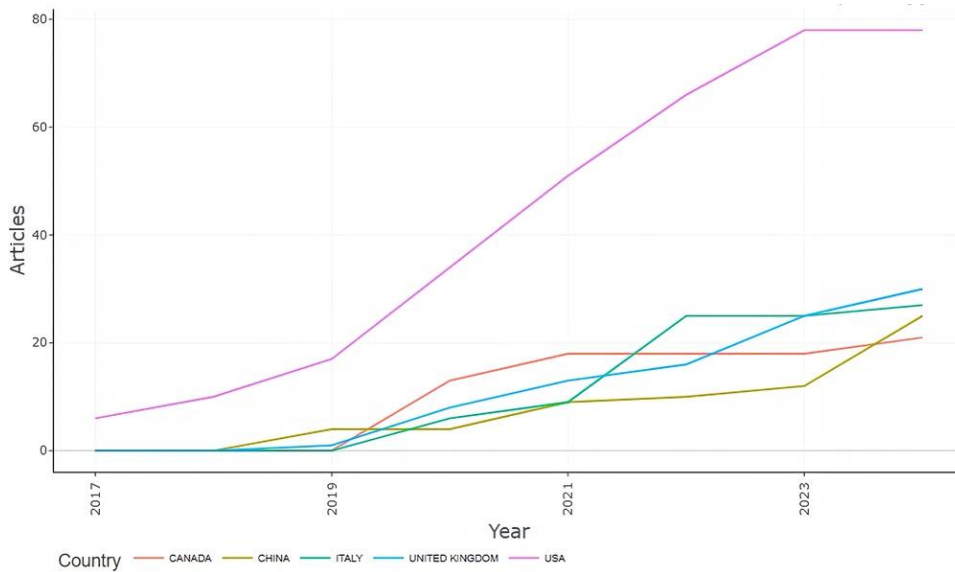


Figure 9. Country production over time

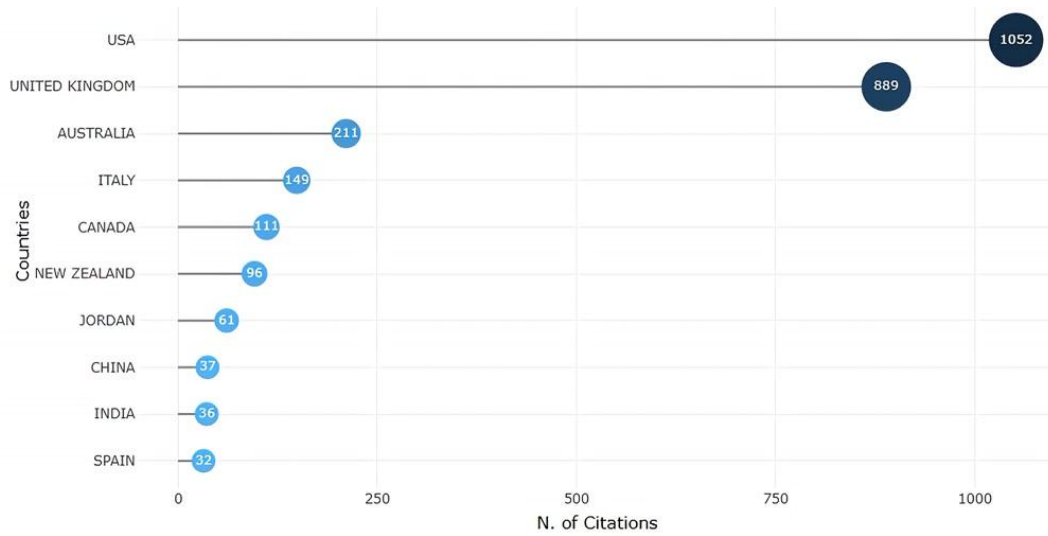


Figure 10. Most cited countries

3.1.7 Most cited documents

Figure 11 shows 10 top citation documents in this field of science, with more than 100 citations per document. The most citations are (from Kamble et al., 2019). The International Journal of Production Research discusses the adoption of blockchain in the supply chain, followed by (Dai & Vasarhelyi, 2017). The Journal of Information Systems discusses achieving blockchain-based on accounting and assurance.

3.1.8 Keywords

Based on the results of Figure 12 Treemap frequency analysis of the keywords used in the article, it shows that the words "Blockchain" and "auditing" appear more often, as much as 46% and 7%, followed by "accounting" as much as 6%, "artificial intelligence" 4%, "smart-contract", and "big data" as much as 4%. In Figure 13, the word cloud shows the word size; the larger the word, the more often the word is used. The results show that in addition to those described in the frequency analysis, there are other words such as "cryptocurrency", "internet of things", "audit", "distributed ledger," and "triple-entry accounting". It can be a challenge for AIS professionals to always upgrade their abilities to keep up with the development of the use of blockchain, which is increasingly widely used in the field of accounting science. Images with small word sizes can be an opportunity for research expansion or a sign for future research.

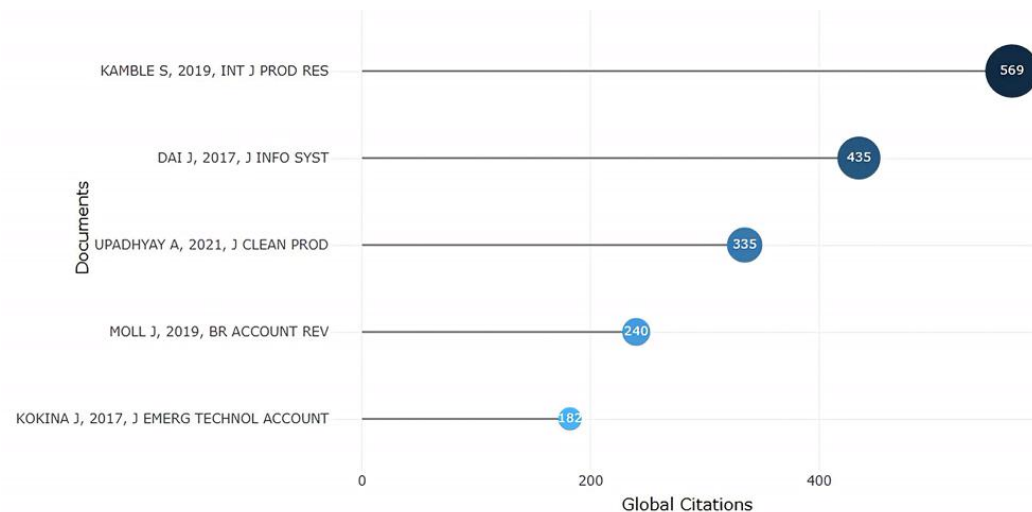


Figure 11. Most cited documents

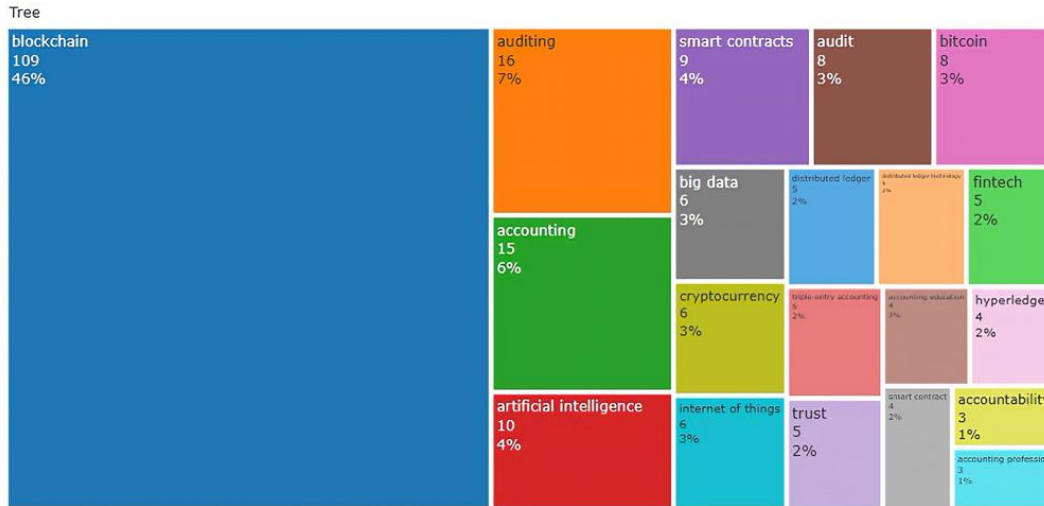


Figure 12. Treemap

3.2 Data visualization

In network analysis, data visualization is used to assess and observe the number of groups that appear, the relationships that arise between various units, the strength, and the number of citations (Aria & Cuccurullo, 2017; Low & Siegel, 2020). Since the beginning of 2015, the emergence of blockchain technology in the accounting field has attracted the interest of academics and practitioners in developing it—discussion of visualization data regarding thematic map fields and theme progress. To retrieve themes from the network, it is necessary to use many methods depending on the unit of analysis, such as the source or Journal, Author, and keywords used (Aria & Cuccurullo, 2017). Mapping in the explanation of data visualization is divided into three types of knowledge structure: conceptual, intellectual, and social structures. The following explanation refers to Figure 2.

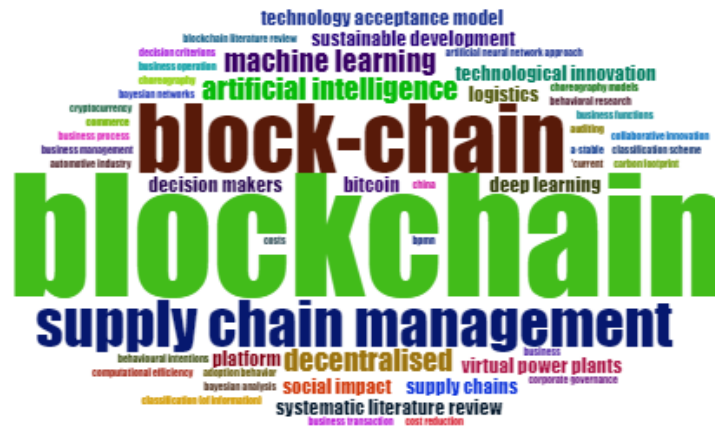


Figure 13. Word cloud

3.2.1 Conceptual structure

Based on the results in Figure 14, the keyword co-occurrence network. Keywords are taken based on words commonly used in article documents, article titles, and bibliographies, called "author's keywords". The occurrence of these keywords can capture the content wholly and comprehensively (Garfield, 2001; Zhang et al., 2019). Based on the data in Figure 14, the existing image has three colors, namely red, blue, and brown, so different clusters are represented by different colors. Each cluster is interconnected, and large-size keywords mean that they appear most prominently in the document. The word "blockchain" has an extensive word size; the word "blockchain" is related to clusters with other colors and other keywords in the co-occurrence network. This indicates that the development of blockchain usage is spreading across several clusters with different colors. When looking at the development of co-occurrence networks, There are future research opportunities with small clusters, indicating that the theme needs to be developed and research can be carried out.

3.2.2 A thematic map

A thematic map is a two-dimensional image that is the basis for themes divided based on typology. The thematic map is divided into four quadrants divided into two dimensions based on centrality and density; the following themes can be shown, namely "supply chains", sustainable development, "machine learning", "decision makers", "technology acceptance models," "blockchain supply management". Based on Figure 15, the themes of "machine learning", "decision makers," and technology acceptance models have a level of density and centrality on the upper right side of the figure, called the driving theme, which has an impact on blockchain technology. In the "blockchain" theme, "supply chain management" appears in the lower right of the quadrant, in the quadrant area as a basic theme, a sign of importance but not much developed to be researched in the area. The upper left of the quadrant explains the niche theme of "supply chains" and "sustainable development," which means that the supply chain can be a sustainable technology used in the field of accounting; this niche theme outlines an important discussion. Finally, at the bottom left of the quadrant, the quadrant indicates developing or declining. The following theme, "Systematic literature review", indicates that there is a growing or declining systematic literature review research. However, currently, some systematic literature research discusses the topic of blockchain in this accounting field.

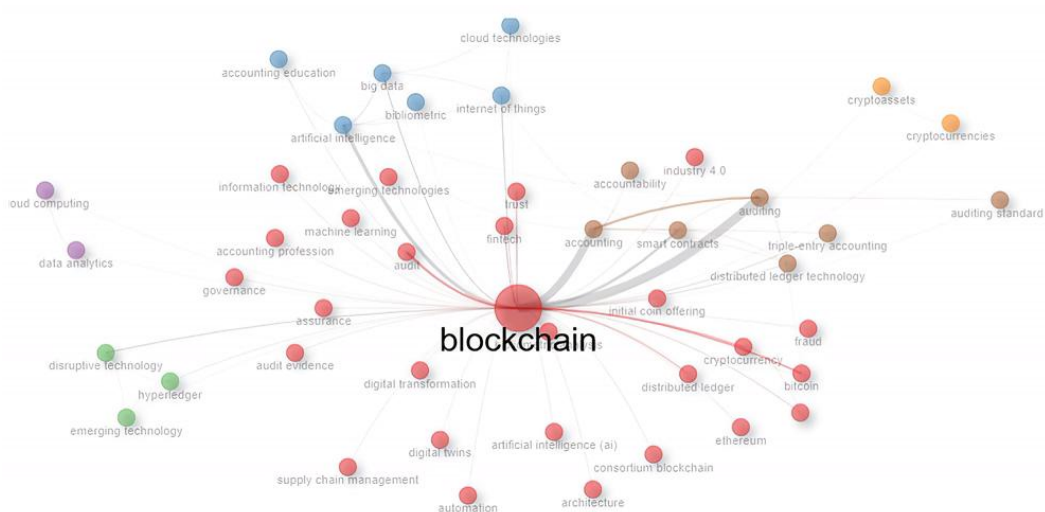


Figure 14: Co-occurrence networks

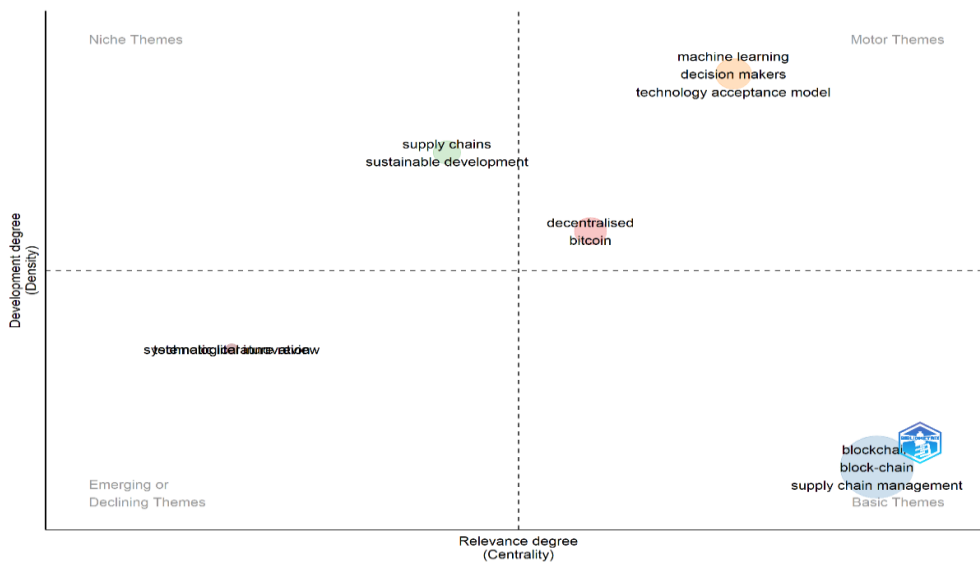


Figure 15. Thematic map

3.2.2.1 Thematic evolution

Thematic evolution provides a comprehensive flow, which provides changes in the field over time through images for easy understanding. Referring to Figure 15, centrality and density are components of keywords and lead to the evolution of research areas. (Chen et al., 2019; Della Corte et al., 2019). Researchers used the "author's keyword" field to develop thematic evolution. Figure 16 shows that in 2017-2022 there were two keywords, namely "bitcoin" and "blockchain". Thematic evolution developed in 2023-2024 as many keywords as "blockchain", "smart contracts", "cryptocurrency", "triple-entry accounting", "distributed ledger", and "artificial intelligence". These growing keywords are a great opportunity for researchers to develop more deeply, and co-occurrence clusters that are still few or undeveloped can be considered.

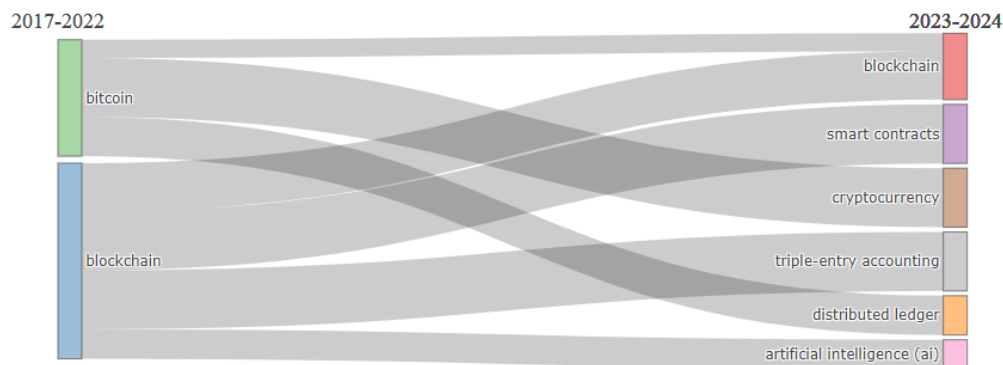


Figure 16. Thematic evolution

3.2.3. Intellectual network

Intellectual networks can be referred to as co-citation analysis based on articles, authors, and countries that are the destination in the intellectual structure. The explanation gives an overview of the collaboration between research groups and research communities with many universities in the country. (Cobo et al., 2011; Mendes et al., 2017).

3.2.3.1 Analysis of citation and co-citation

An important discussion in this field is where to conduct citation analysis of the relationship. According to (Egghe & Rousseau, 1990). The presentation of citation documents implies a relationship between the similarity of research topic objectives, approaches or methodologies, and others when viewed from the author's perspective. In Figure 17, there are ten clusters divided by color; the size of the author's centrality indicates the higher influence of his main article on other articles (Hu et al., 2013; Ingale & Paluri, 2022). This analysis can be done to see the interconnectedness and conceptualization of historical events and research through journal relationships. (Garfield, 2001). In addition, a higher number of citations is also a sign that the article is of high quality and relevant to the field (Ruggeri et al., 2013; Ingale & Paluri, 2022), and (Ruggeri et al., 2019). Figure 17 shows that Nakamoto (2008) and Schmitz and Leoni (2019) have a big impact on blockchain technology; the size can prove this is larger than the size of other author's writings. Both articles written by researchers become references for development research citations from other researchers.

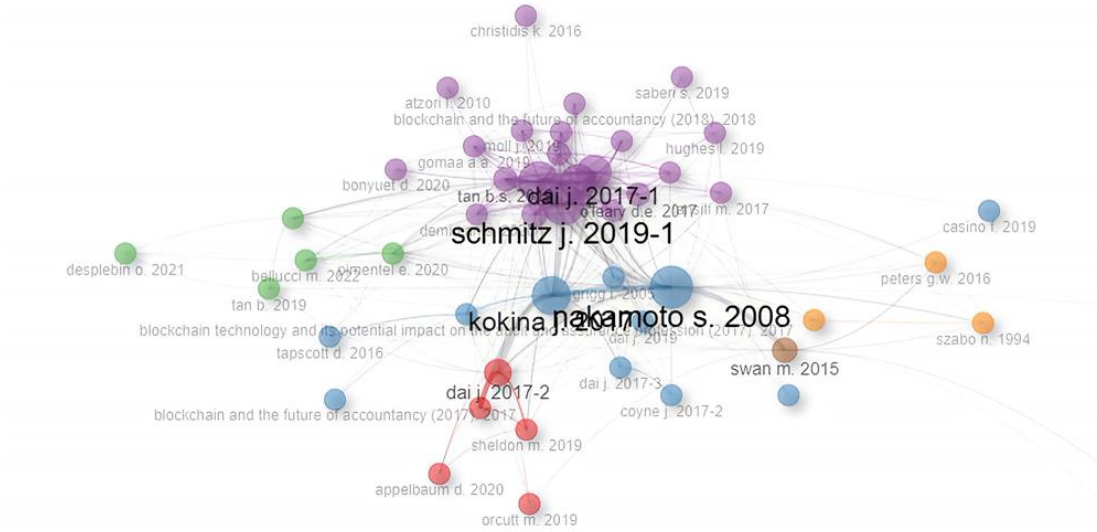


Figure 17. Analysis of citation and co-citation

3.2.4. Social network analysis

Social Network Analysis (SNA) aims to analyze social structures using network and graph theory (Pendse et al., 2023). Network structure is used to explain based on nodes such as author, institution, and source of publication or Journal. What makes ties or links interconnected indicates relevant relationships in the social network. In Figure 18, there is a collaboration between authors; when viewed in Figure 19, there is a collaboration between countries that form the collaboration in Figure 18. Strong country collaboration in the countries "USA", "United Kingdom", "China", and "Australia". The collaboration is carried out in developed countries. However, it has not been illustrated in developing countries.

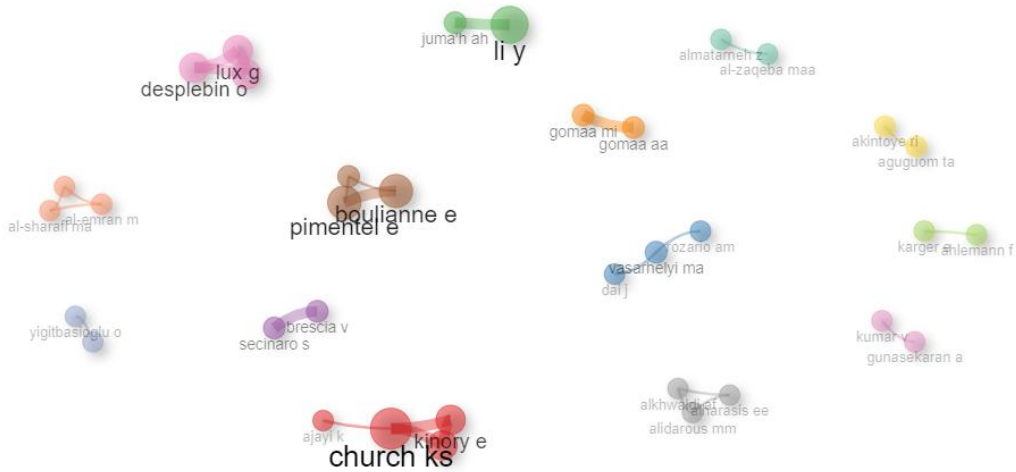


Figure 18. Collaboration networks

Country Collaboration Map

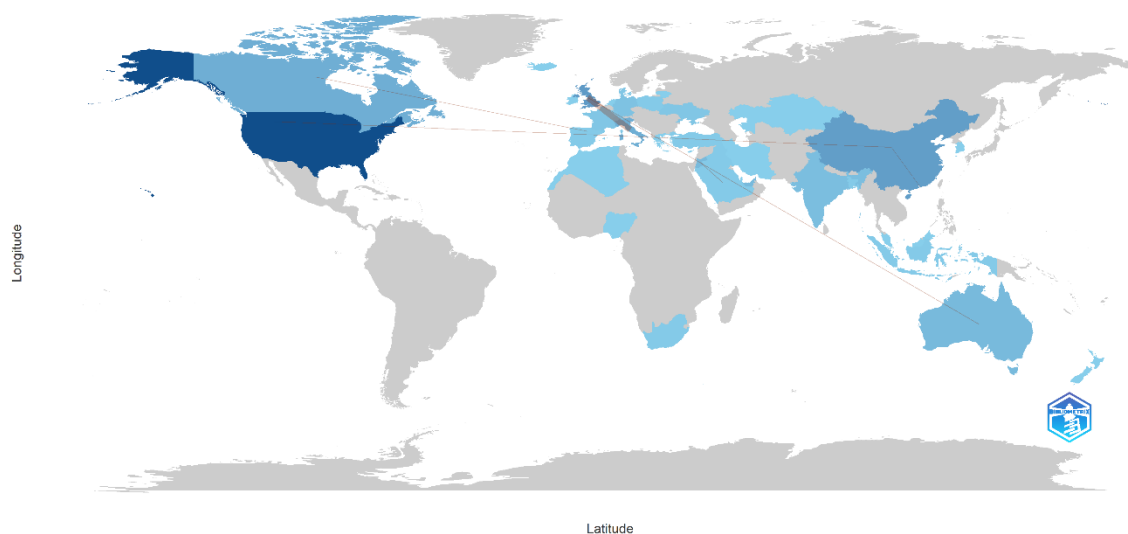


Figure 19. Country Collaboration

5. Conclusion

The research aims to investigate the evolution of the use of blockchain in accounting over the 2015-2024 decade using bibliometric analysis. Including conceptual, intellectual, and social network topics. To create a path for future research opportunities. Currently, research discussing the concept of blockchain in accounting is growing. Therefore, it is necessary to know the network to discover the paths, researchers, and technologies that use blockchain. To analyze the data using biblioshiny, which is the Bibliometrix R-Studio package. Data is taken from the Scopus database because it has many high-quality published articles, and bibliometric software can be used.

This research explains the descriptive analysis of authors, journals, documents, and datasets. Network analysis explains social structure focusing on collaboration networks based on authors, institutions, or countries. The intellectual structure reveals co-citation analysis based on papers and points related to popular authors and papers clustering. The conceptual structure reveals co-occurrence networks, thematic maps, and thematic evolution. It focuses on blockchain and its linkages, such as cryptocurrency, smart contracts, triple-entry accounting, distributed ledger, and artificial intelligence.

Researchers tried to take data on data starting in 2015, but data is available since 2017. The results show that in 2017 there was little research on blockchain until publications peaked in 2021 and 2023. This research shows that the use of blockchain in the accounting domain was widely researched in that year. The dynamic capabilities of accountants have evolved. Initially, blockchain systems were only used in cryptocurrency; now, they are increasingly developing, such as using blockchain in supply management. (Xu et al., 2021). The use of blockchain as triple-entry accounting (Cai, 2021), Hyperledger (Church et al., 2021), and carbon emissions (He et al., 2024) use in the field of auditing (Schmitz & Leoni, 2019). This indicates the need for expansion and collaboration of knowledge and experience in accountants, especially AIS professionals, to create a sustainable profession for accountants.

Since the emergence of the idea of blockchain, which was initially used in the record-keeping of cryptocurrencies (Nakamoto, 2008), many researchers in various countries are interested in conducting research, especially in the field of accounting, such as the "USA", "United Kingdom", "Italy", "Brazil", "China" and other countries. These countries contribute a lot of research in the field of blockchain in accounting. The contribution of research in the country is based on the author of the country. When viewed from the country network, the country category is a developed country, which indicates that the use of blockchain is an early concern in developing technology in developed countries, especially in accounting. Many of these publications are recorded in the journals "Journal of Emerging Technologies in Accounting", "Journal of Information Systems", "Accounting Perspectives," and others. Referring to Figure 14, the conceptual structure of blockchain has now spread to the accounting field, especially in auditing, recording financial statements, and supply-chain management. However, many areas of use still have not been explored and developed. When looking at the main points, the small circles in the figure indicate future research opportunities. They are of concern to world researchers to be developed, such as how the system affects auditing standards, data governance and financial information, big data, cloud technologies, artificial intelligence, data analytics and so on.

This research provides important input for academics, AIS professionals, and policymakers to change the curriculum to expand and enrich their knowledge and expertise on the use of blockchain systems and policymakers to follow the dynamics of the development of blockchain technology so that they can regulate regulations such as taxation and side effects. Researchers can use bibliometrics analysis to explain publication patterns by referring to citation references, authors, sources, countries, collaborations between countries, journals, authors depicted on thematic maps, and thematic evolution to explore the publication's theme. This research aims to introduce the concept of blockchain in accounting, facilitating a clearer understanding for readers. It contributes to both the visible and invisible advancements in this field, laying the groundwork for future studies to explore the potential of blockchain in enhancing privacy and security, particularly in the context of cyber attacks that compromise accounting information.

4.1 Practice implications

Integrating blockchain technology into accounting is essential for achieving sustainable competence, necessitating dynamic capabilities among accountants, particularly those specializing in Accounting Information Systems (AIS). Collaboration with other disciplines, especially information systems, is crucial to continually develop and maintain sustainable competence.

4.2 Academic implications

The current research provides further insight into the practical use of blockchain technology, where changes to the academic curriculum encourage students to continue developing their knowledge guided by teachers to create sustainable professional AIS competencies.

4.3 Regulatory implications

This article provides an overview of the role of regulators in overseeing the development of blockchain technology, ensuring its continued advancement while monitoring potential side effects and identifying the parties that may be harmed to inform the creation of flexible and effective regulations.

4.4 Limitations and future research

This session explained the limitations of the research where this research only took the years 2015-2024, but the Scopus database was only available from 2017-2024; the researcher assumed that there were limitations in using keywords to search for data in the Scopus database. Future research should consider other databases, such as the Web of Science, so as to increase knowledge about this field of science.

Future researchers can refer to the conceptual structure, which discusses co-occurrence, thematic maps, and thematic evolution. In the discussion of co-occurrence, researchers can develop small themes that indicate that the research has not been widely researched or can be said to be a hot issue that is a future research opportunity for researchers to develop. When referring to thematic maps, there are clusters of basic themes that are basic issues to be developed, such as supply chain management, and clusters of motor themes discussing machine learning for decision making, and thematic evolution discussing blockchain development. When looking at Figure 16, there is a development of issues. These developments extend to smart contracts, artificial intelligence, cryptocurrencies, triple-entry accounting, and distributed ledgers. Future research can combine these two areas in the conceptual structure area.

Future research is still abundant in information systems science using blockchain, such as providing curriculum frameworks for students related to accounting science using blockchain, building blockchain-based frameworks in big data analytics and artificial intelligence, and expanding in cyber security and data privacy. In the field of government, there is a need for research on the side effects of using this system, evaluating it in terms of taxation, and providing a framework for using blockchain in government information systems.

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