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E-Voting: A Bibliometric Analysis of Scopus

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Abstract:
This study aims to determine the development of research publications on the themes of "e-voting," "electronic voting," "digital voting," and "internet voting." The objective of an e-voting bibliometric study is to offer a thorough and data-based overview of the field. By examining articles ranging from the early 2000s to the present, this study can discern enduring trends and patterns in e-voting research. This quantitative investigation employed a literature review utilizing the Scopus database to identify studies pertaining to electronic voting. The VOSviewer software processed the graphically represented outcomes. The findings of this study indicate that 2020 has the highest number of e-voting research publications. The United States contributes the most to research publications. The predominant publication domains are computer science, methodologies, and information systems. The study analyzes an extensive collection of papers from Scopus to ensure a comprehensive representation of the voting literature as the platform provides a range of metrics for assessing research impact and collaboration features such as author profiles and a collaboration network. The keyword analysis revealed that the terms "e-voting" and "blockchain" dominated the researcher domain. Keywords like "electronic voting" and "voting machine" form a dense cluster, which indicates their central importance in the field. Emerging trends, such as e-voting, cryptography, and voting systems, should be considered in future research.

Keywords: Electronic voting, Internet voting, Blockchain, Internet of things.

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电子投票：斯高帕斯的文献计量分析

摘要:
本研究旨在确定“电子投票”、“电子投票”、“数字投票”和“互联网投票”主题的研究出版物的发展情况。电子投票文献计量学研究的目的是提供该领域的全面和基于数据的概述。通过研究从 2000 年代初到现在的文章，本研究可以辨别电子投票研究中的持久趋势和模式。这项定量调查采用了文献综述，利用斯高帕斯数据库来识别与电子投票相关的研究。VOS查看器软件处理了以图形方式表示的结果。本研究的结果表明，2020 年的电子投票研究出版物数量最多。美国对研究出版物的贡献最大。主要的出版领域是计算机科学、方法论和信息系统。该研究分析了斯高帕斯中的大量论文，以确保全面呈现投票文献，因为该平台提供了一系列用于评估研究影响和协作功能的指标，例如作者资料和协作网络。关键词分析显示，“电子投票”和“区块链”这两个词在研究领域占据主导地位。“电子投票”和“投票机”等关键词形成了一个密集的集群，这表明它们在该领域具有核心重要性。未来的研究中应该考虑电子投票、密码学和投票系统等新兴趋势。

关键词：电子投票、网络投票、区块链、物联网。

1. Introduction

Voting is one of the most basic ways to describe political decisions made by individuals under the supervision of a democratic government. Technology is essential for minimizing expenses and making voting more accessible for all parties, especially voters. As an improvement to the voting system, electronic voting (also known as e-voting) has the potential to save expenses and reduce manual involvement; it has been suggested as a better option than the ballot system and has been put into practice in certain situations (Anitha et al., 2023). Democracy is highly dependent on political involvement in the voting process during elections. If public awareness increases, the voting process can be intimidating, making it challenging to obtain votes. However, empirical studies (in Canada, Estonia, the United Kingdom, and Switzerland) have been inconclusive.

E-voting has yet to have a discernible impact on voter turnout. Instead of recruiting new voters, it replaces established voting systems, such as postal ballots (Oostveen & Van Den Besselaar, 2004). Traditional voting processes lack transparency, smooth operation, and calculation. Generally, the entire traditional voting system offers no transparency or guarantee of fair voting (Farooq et al., 2022). Conventional methods are used to ensure that there is no fraud or manipulation. However, there is no guarantee that the issues of fraud and unfairness in general elections will be resolved. Electronic voting is presently in the research phase due to potential challenges including transparency, integrity, equity, voter anonymity, and decentralized vote tabulation.

Researchers have widely discussed this topic and investigated the security aspects of using an e-voting system to assess the need for or effectiveness of blockchain technology in realizing the method (Rajakumar et al., 2023). Electronic voting machines (EVMs) in India have been developed since 1989, when Indian citizens no longer use paper to vote. EVMs were introduced in India on an experimental basis in 1998 in a select few constituencies in state assembly elections (Ravi, 2019). Debnath et al.’s (2017) study provides strong evidence that the introduction of EVMs led to (i) a significant decline in electoral fraud, (ii) the strengthening of weaker and more vulnerable sections of society, and (iii) a more competitive electoral process.

E-voting can improve election credibility, but there is also the risk of hacking, where votes can be changed (News24, 2019). To explore and provide insights into existing studies on e-voting publications, the bibliometric method of research will permit analysis of journal articles at various levels, such as the article type, the field of study that discusses the same topic (i.e., e-voting), and the trend of publishing articles related to the topic based on the number of articles published by countries around the world. A bibliometric analysis is crucial for facilitating the development of research on e-voting adoption and generating avenues for further investigation in this domain. Even though e-voting systems have yet to be implemented on a large scale throughout the country, the promising futures of their integrity, accountability, and transparency keep researchers and academicians debating and arguing about the system.

Agbesi et al. (2023) found that to enhance the integrity of e-voting systems, measures such as increasing transparency regarding the system's security protocols, conducting independent security audits prior to elections, implementing rigorous monitoring of the electoral process to ensure fairness, and establishing mechanisms for addressing security breaches while enforcing accountability would significantly improve the transparency of internet voting systems. It suggests that by integrating the machine learning concept, adding a facial recognition system would be a great addition because it improves security and prevents duplicate and forged votes; therefore, blockchain technology and the internet of things (IoT) could be an answer to the transparency of e-voting.

Blockchain technology provides a transparent ledger accessible to all participants. This transparency ensures

that all transactions (votes) are visible, thus enhancing trust in the voting process. The IoT has revolutionized various sectors, resulting in the development of smart homes, grids, transportation systems, agricultural practices, urban infrastructures, and healthcare networks. Consequently, the integration of blockchain technology with the IoT has given rise to a novel domain, blockchain in the IoT (BIoT). These interconnected systems provide a new dimension to electronic voting and present new opportunities and challenges that motivate researchers to explore how these advancements can be harnessed to improve voting systems to make them more efficient, accessible, and secure.

Various studies analyzed data related to e-voting through systematic or literature reviews. This study employs a bibliometric methodology to analyze articles published in journals on e-voting at a global scale. Data analysis using the bibliometric method is needed for e-voting in developed countries. In this section, the study relies on discussing previous studies on e-voting using the bibliometric analysis method. For example, Anitha et al. (2023) conducted a bibliometric analysis of blockchain technology in e-voting. Their study examines publication types, subject areas, secondary data, trends, geographical publications, and citations. The authors constructed the literature for bibliometric analysis using Scopus. Since technology such as blockchain and the IoT is growing and connected to a variety of fields (i.e., cryptocurrency, bitcoin, Hyperledger Sawtooth, management of identities, data storage, and different sensors for timestamps), there is a need to study e-voting publications, in general, using bibliometrics analysis, which has become a part of blockchain and the IoT technology. Therefore, to what extent has the publication trend in electronic voting evolved over the past decade, and what knowledge gaps in the field warrant exploration in future research?

2. Literature Review

E-voting encompasses casting and tabulating votes through electronic means, primarily utilizing computers or other electronic devices. It is an alternative to traditional paper-based voting systems and is often seen as a way to streamline the voting process, improve accuracy, and increase voter accessibility. However, there has been much discussion about electronic voting. Many individuals feel that because there are questions about the reliability and integrity of voting machines and the votes cast using them, electronic voting must be more trusted for use in essential elections (Tarasov & Tewari, 2017). To some extent, the existing research and publications on e-voting have created awareness among people about adopting electronic voting and the technology that supports the system.

Academic awareness of the development of blockchain technology has increased significantly in relation to the IoT. The active research field plays an essential role in the development of society. Englishman Kevin Ashton introduced the IoT in 1999. He described a system that allows a range of physical items to connect to the internet via sensing devices (Thoutam, 2021). Blockchain technology has also been applied to many fields, including voting and election reform. Blockchain is a distributed ledger technology (DLT) using a distributed transactional database and includes cryptography, security, and consensus mechanisms (Yli-Huumo et al., 2016).

To be a functional "end-to-end" E2E verifiable system, an electronic voting system must be safe while permitting the most significant amount of openness. Blockchains make this degree of security and transparency possible (Nakamoto, 2019), preserving transaction privacy and non-malleability (Deloitte Nederland, 2016; Glass, 2016). The emergence of blockchains has made it possible to develop secure systems using a new methodology with fewer inherent security flaws. There is a notion that blockchains can be used to create successful voting systems or that a blockchain can be one of the critical components of a hybrid electronic voting system (Bradbury, 2014).

A study by Kuzior and Sira (2022) on the bibliometric analysis of blockchain technology using the Scopus database revealed that the number of research publications increased significantly from 2016 to 2021. The notable surge in articles can be attributed to the widespread enthusiasm of organizations to use blockchain technology and voting systems, trustworthiness, and security as part of the researcher's interest. Interestingly, China became the country with the most publications in blockchain technology and the most influential country in this field (Kuzior & Sira, 2022; Kamran et al., 2020). China's government actively promotes technological advancements like "Made in China 2025" and the "Digital Silk Road." IEEE Access is a multidisciplinary journal containing the largest number of documents. Blockchains, the IoT, digital storage, security, network security, smart contracts, artificial intelligence (AI), blockchain technology, distributed ledger technology (DLT), and privacy are among the most frequently co-occurring keywords that are significant in electronic voting systems.

Another bibliometric study by Amrutkar et al. (2021), using the Web of Science (WoS) database, on the systematic review of new blockchain-based electronic voting systems showed that the number of publications has been rising since 2017, and England is the leading country in which blockchain studies are published. Like Kuzior and Sira (2022), the research shows that the maximum number of publications is from IEEE Access. The results suggest that more research should be conducted on how to use frameworks like Hyperledger Sawtooth to design an e-voting system that can be used in real-life election scenarios and is scalable. This will make blockchain and e-voting systems accountable.

Another technology interconnected with blockchain

is the IoT system, which operates in conjunction to enhance speed, efficiency, and security for biometric voting (Essah & Ampofo, 2023). Since information systems and the IoT have become relevant in recent years, the expectation of high publications and their connectivity with electronic voting will enhance researchers' writing. An examination of the Scopus database, utilized in the Garcés-Giraldo et al. (2023) study on the IoT research trends, reveals fluctuations in the annual number of publications over the 14-year period from 2009 to 2022, demonstrating both increases and decreases. In 2021, they had the most publications, with the main topics being intelligent information systems and cybersecurity. The country with the highest number of publications is China followed by India. The keyword network between the IoT and information systems in this study shows that its emphasis on smart cities, cloud computing, distributed computer systems, information services, and information management are related, which explains why the IoT system's connectivity is broader than others.

In a study by Essah and Ampofo (2023) on biometric voting utilizing the IoT system, a bibliometric analysis using the Scopus database found that the annual trend of publications on the subject matter kept increasing from 2015 to 2021. The findings show that China has the most significant number of publications, citations, and overall link strength. Computer science and engineering are the dominant fields that demonstrate significant predominance in specialized biometric voting journals. Regarding coauthorship cooperation, the study indicates the strength of international cooperation in biometric voting using the IoT to transfer votes to a central research system. The group of nations consists of China, India, the United States, South Korea, and Saudi Arabia.

A bibliometric study on the integration of blockchain and the IoT, referred to as BIoT, has garnered significant attention from researchers. For instance, a survey conducted by Kamran et al. (2020) demonstrated that in recent years, publications on BIoT have been increasing in both BIoT domains. The number of citations of relevant research papers has grown substantially since 2017 and continues to increase annually, with Computer Science and Engineering dominating the publication category in the WoS database. China has published the highest number of papers on BIoT, followed by the USA. In keyword analysis, most of the research conducted in the BIoT domain is related to security and privacy, which are integral parts of electronic voting. The keywords that emerged in the works by Kamran et al. (2020), Essah and Ampofo (2023), and Kuzior and Sira (2022) were "security," "IoT," "blockchain," "internet of things (IoT)," "smart contract," and "computing."

Reen and Gochhait (2020) examined electronic voting using the WoS database and an applied bibliometric analysis approach. The analysis reveals constructive growth in literature since 1988. It was found that the USA contributed the most papers. The outcome also demonstrates that Western European nations have generated influential papers. At the same time, China is the only ASEAN country that generates paper equivalent to that of European countries. Volkamer, Melanie, is the strongest co-author and the most significant contributor to the research. Computer science information is the most researched area in the field of e-voting.

Additionally, during the period, the frequency of citations for these works exhibits a rapid annual increase. This demonstrates that research on digital voting is growing. However, these studies did not analyze keywords, which is crucial for determining the strength of pairs of topic areas or keywords and clusters that represent the relationship between one topic and another.

Only a few studies have been conducted on e-voting in elections, and they have applied technology to focus on a particular topic. In a survey by Suprianto and Affandi (2020), Thiga (2020) found that student participation in an electronic voting system is increasing due to the implementation of e-voting, which runs more effectively and efficiently than the conventional method, which requires time, cost, and human resources. The confidentiality of the data is guaranteed; therefore, students gain confidence in the approach. A study by Farooq et al. (2022) on blockchain-based solutions for the voting system suggested methods to use blockchain voting systems to expedite, lower costs, and increase the reliability of the voting process. Because they have a transparent system, they can rely on it to help improve people's ties with their democratic state.

Blockchain and the IoT are linked; thus, a study was conducted on the bibliometric analysis of biometric voting that used the IoT to send votes to a central system to determine trends, state of the art, and other signs. Related studies on e-voting using bibliometric analysis that use the Scopus database are needed. Based on reviews of the literature on blockchain, the IoT, BIoT, and related e-voting using bibliometric analysis through Scopus or WoS, there is a need to provide literature specifically on e-voting through bibliometric analysis using Scopus that can show the development of the publication over the years, influential countries, subject areas, a prominent author, and keyword analysis.

This study used the Scopus database because it is known for its extensive coverage of scientific literature, including journals, conference proceedings, and patents. It indexes many reputable journals from various disciplines, ensuring a broad range of research sources. Scopus provides a robust citation analysis tool that allows users to explore citation patterns, track citations of specific articles, and evaluate the impact of research. It offers metrics, such as the h-index, citation count, and field-weighted citation impact (FWCI), which can help assess the influence and visibility of researchers and publications. Using sophisticated profiling algorithms and hand curation, Scopus provides comprehensive author and institution profiles with high precision and recall. Because of its reliability, Scopus is used as a bibliometric data source for extensive analysis in research assessments, research landscape studies, scientific policy evaluations, and university rankings

(Baas et al., 2020). Scopus has earned its equal place as a comprehensive bibliographic source, and it has proven reliable and, in some respects, even better than WoS (Harzing & Alakangas, 2015; Zhu & Liu, 2020). While the WoS also includes author information, its profiles typically should be more comprehensive.

Studies using bibliometric analysis are required; in practice, it is used to assess data quantitatively. It can also be used in various disciplines. Most bibliometric data analyses may also be presented in a format different from that of standard data analyses. After the data were collected from the chosen search engine, they were evaluated using the mind-mapping approach, which demonstrates the boundaries of knowledge (Van Eck & Waltman, 2017).

3. Bibliometric Analysis

Bibliometric analysis has become common in business research because of advances in software and databases (Donthu et al., 2020, 2021; Khan et al., 2021). The bibliometric analysis evaluates the scholarly impact of publications, authors, and journals. This method can provide insights into publication, collaboration, citation, and keyword analysis. It can also be used to evaluate the quality and efficacy of scientific publications and research policies. Bibliometric analysis can provide valuable insights, but it is essential to understand its limitations.

The general goal of this study was to conduct a bibliometric analysis of the scientific production in e-voting publications based on the Scopus database. For this bibliometric analysis, the priority of this paper is as follows:

1. What are the current trends in publications, types of publications, top journals, countries, renowned authors, primary research keywords used by authors in e-voting, and countries with the most co-author collaborations?

2. What themes emerge in the field of e-voting that future researchers should examine shortly?

4. Data Sources and Methodology

Bibliometric analysis can be used in various research methodologies (McBurney & Novak, 2002). The research objects were scholarly articles published in article journals indexed in the Scopus core collection from 2004 to 2023. This database was selected due to its comprehensive coverage of high-quality research in the field of electronic voting, its extensive and interdisciplinary nature with a substantial number of relevant articles, the availability of citation data, and the compatibility of its export format with bibliometric software to determine the temporal evolution of e-voting research trends. Flow analysis can measure the productivity of organizations, countries, writers, citations, documents, and others (Kurtz & Bollen, 2010). This encompasses the examination of data, emphasizing comparisons between different years and the study of data from other countries around the globe. Collaboration between writers and scholars affects the relationship between scholars and their works (Qiu et al., 2014). For this research, choosing data sources from the Scopus database is critical when conducting bibliometric analysis. The Scopus core collection comprises approximately 4,509 high-quality publications. All searches and downloads of the data were extracted on July 27, 2023, to avoid any changes caused by daily updates to the database. The literature search was performed using an advanced query, and the exact search strategies are listed below.

TITLE-ABS-KEY ("e-voting" OR "electronic voting" OR "digital voting" OR "internet voting") AND (EXCLUDE (SUBJAREA, "VETE) OR EXCLUDE (SUBJAREA, "DENT") OR EXCLUDE (SUBJAREA, "HEAL") OR EXCLUDE (SUBJAREA, "IMMU") OR EXCLUDE (SUBJAREA, "NURS") OR EXCLUDE (SUBJAREA, "NEUR") AND LIMIT-TO (LANGUAGE, "English")

The irrelevant subject areas, such as veterinary, dentistry, health profession, immunology, microbiology, nursing, and neuroscience, were excluded from the raw data. The chosen language is limited to English. After screening, approximately 4,339 documents were obtained using the retrieval method, as shown in Figure 1. Although the year of publication has not been limited, they play a significant role in increasing information sharing and developing electronic voting.

The analysis used to discuss e-voting was very detailed; all studies in the Scopus database cover 1969–2023. However, the analysis considered only data from 2004 to 2023.

The quantity of studies published and indexed in Scopus pertaining to e-voting has exhibited a substantial increase over the past two decades in comparison to the number of studies conducted in the preceding year.

Data sets have been transferred into plain text (.txt) and comma-separated value (.csv) formats. VOSviewer was used to analyze all displayed documents.

The analysis conducted in this work is descriptive and quantitative, based on the techniques and tools of bibliometric analysis of documents stored in the Scopus bibliographic database.

Figure 1. Flow chart of the bibliometric analysis using VOSviewer (The authors)

In this research, seven steps of bibliometric analysis are adopted: topic, scope, keywords and search, data extraction, data statistics compilation, record screening, and data analysis. The steps of this study are described in Figure 1.

5. Data Analysis

5.1. Publications on E-Voting

The trend of publications for this research spanned from 2004 through 2023, as evidenced by the data indicating an increase in publications during this period. Figure 2 illustrates how Microsoft Excel was used to analyze the annual publication trend based on bibliographic data. Trends in publications can be divided into four stages within five years. The initial stage of publications, spanning from 2004 to 2008, indicates that the total number of publications amounted to approximately 686 papers. The trend of publications within the first stages indicates that they increased moderately. It achieved 900 publications from 2009 to 2013, the highest number in the second stage. The trend fluctuated with a slight decrease in Stage 3 between 2014 and 2018, with 881 publications. Although the number of publications varied throughout the third stage, e-voting still gained significance. In the fourth stage, between 2019 and 2023, the data show a steady increase in e-voting publication trends, which parallels the increase in blockchain and the IoT publications (Kuzior & Sira, 2022; Amrutkar et al., 2021; Garcés-Giraldo et al., 2023; Essah & Ampofo, 2023). The number of publications reached its maximum in 2020, with 410 publications, but subsequently decreased in 2023. The plausible reason for the slight decrease could be that the field of e-voting research continues to evolve, and more researchers are likely to be working on this topic. With more researchers and limited publication slots, the acceptance rate of e-voting articles could decrease slightly.

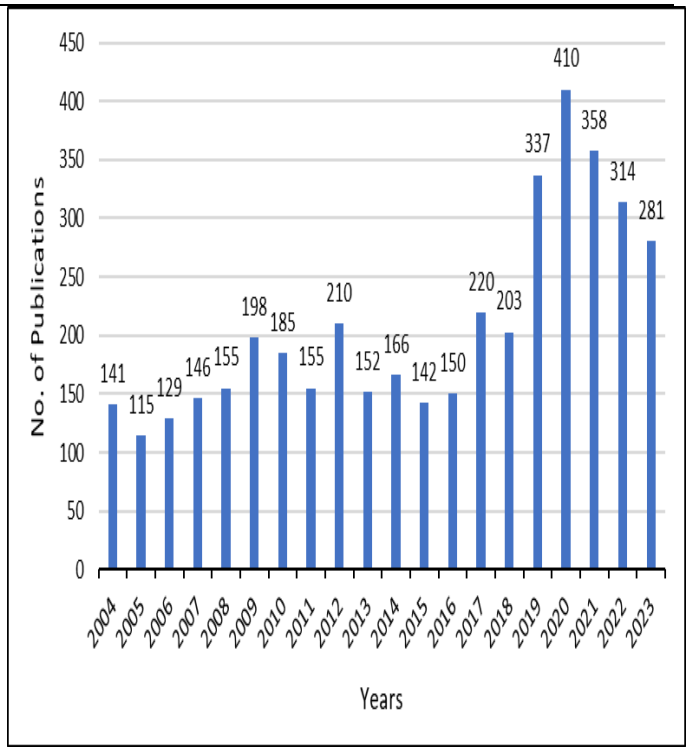

Figure 2. Total publications by year (Microsoft Excel data analysis and Scopus core collection, 2023)

5.2. Most Influential Countries' Publications

Microsoft Excel analysis of the top 10 nations with the most e-voting publications is shown in Figure 3. Based on the Scopus database, we found that the United States is the highest-ranking country among all countries. With 702 papers overall, the United States leads the publication race. European countries, such as the United Kingdom, ranked third with 367 publications. Two Asian nations experiencing economic growth—India and China—ranked second with 585 documents, followed by China with 345 documents. As a developing country, India invests heavily in technology for development, and the e-voting system is no exception (Ravi, 2019; Debnath et al., 2017). The e-voting issues favor Western and European countries. Electronic voting research often favors Western and European countries because of the more advanced technological infrastructure and higher levels of digital literacy in these regions. These countries typically have more resources to invest in developing, implementing, and securing electronic voting systems, making them more conducive environments for such research. However, Asian countries such as India, China, and Japan have shown an interest in e-voting. For example, China has made significant technological advances, including in information technology and telecommunications.

E-voting involves technology and digital systems, making it an interest and focus for researchers in these countries, especially in the fields of BIoT (Kamran et al., 2020; Essah & Ampofo, 2023).

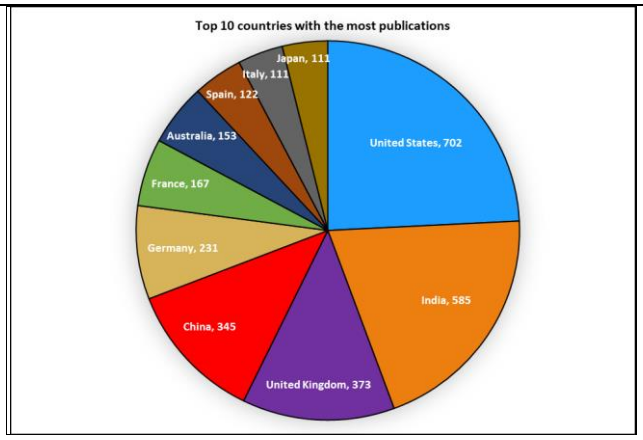

Figure 3. Publications by country (Microsoft Excel data analysis and Scopus core collection, 2023)

The availability of technological expertise and resources contributes to their contribution to the field. Nevertheless, the United States is a leading and prominent Western country that explores and experiences e-voting trends more than its nearest European neighbor, the United Kingdom.

5.3. Total Publications by Author

The top 10 contributors who published articles are shown in Figure 4. The data pertaining to the leading researchers were exported from the Scopus database and analyzed using Microsoft Excel. Volkamer has authored approximately 82 articles, which makes her the most prolific author, while Ryan has written approximately 44 articles. They are actively engaged in research and have made substantial contributions to their fields. Krimmer provided 34 articles at the same time, and Kiayias provided 29. The remaining authors contributed between 22 and 24 articles.

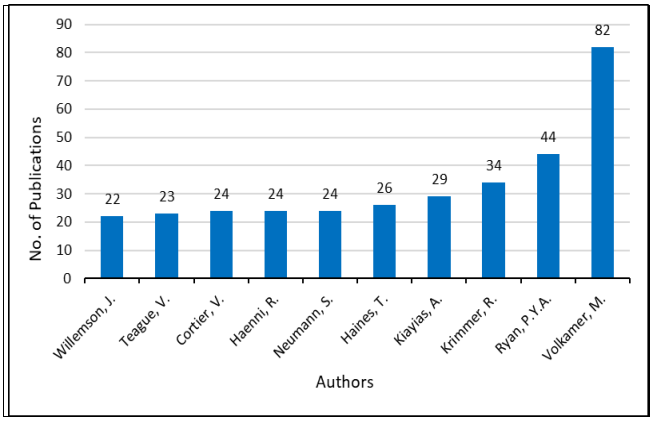

Figure 4. Publications by top 10 authors (Microsoft Excel data analysis and Scopus core collection, 2023)

5.4. Top 10 Publications by Subject Area

The results in Figure 5 show the top ten publications by subject area. Microsoft Excel analysis showed that computer science was dominant in the subject areas of e-voting, with 3475 papers. A disciplinary view of subject areas suggests that besides the predominance of computer science as the primary publication area, areas such as engineering (1347 papers), mathematics (1115 papers), and social (893 papers) appear to contribute substantially to the literature on e-voting. Other research areas, such as material science, energy, medicine, physics, astronomy, business, management, accounting, and decision science, contributed between 82 and 451 papers. Computer science dominates this topic and is highly regarded as a medium for building voting systems, such as the design of e-voting systems and the verification and accountability of computer systems. Computer science is the primary discussion venue for the researcher, who discusses e-voting and blockchain technology, which offers a new alternative to electronic voting. Computer science offers requisite knowledge in fields like voter privacy, voting process security, and anti-tampering, all of which depend on cryptography (Rivest, 2006).

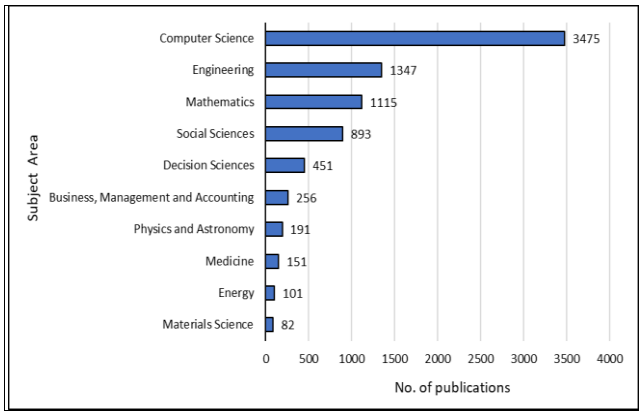

Figure 5. Publications by subject area (Microsoft Excel data analysis and Scopus core collection, 2023)

Software engineering is essential for creating reliable electronic voting systems that can manage widespread implementation and various user needs (Bederson et al., 2003). Network security is crucial for guaranteeing the safe transfer of data and safeguarding the voting process's integrity from online attacks (Kohno et al., 2004). However, e-voting is an interdisciplinary area, as the results demonstrate. In this field, researchers are eager to take advantage of things like focusing on transparency, confidentiality, and non-repudiation, which are crucial for voting applications because blockchain technology opens a new dimension to voting activities.

6. Results and Discussion

This section presents a bibliometric analysis utilizing visual representations to illustrate the study results based on the most frequently occurring keywords. It helps determine the relationship between concepts. Creating co-occurrence networks entails identifying keywords in the text, calculating the frequencies of co-occurrences, and analyzing the networks to find central words and clusters of themes (Segev, 2021). VOSviewer generated visualizations for four analyses:

a) Overlay visualization depicting countries' average citation values, as illustrated in Figure 6

b) Network visualization of author keywords, as presented in Figure 7

c) Density visualization of all keywords, as demonstrated in Figure 8

d) Network visualization and country collaboration of authors, as exhibited in Figure 9.

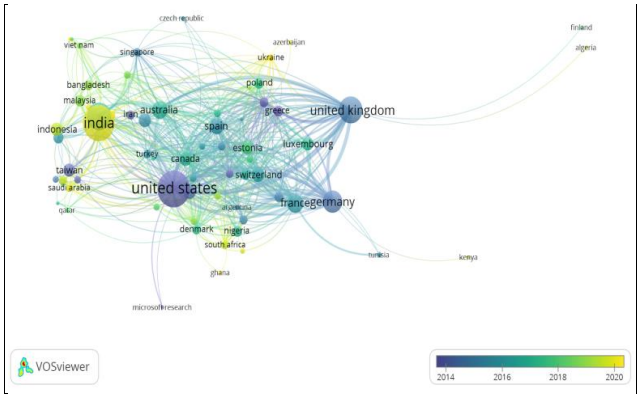

Figure 6. Analysis of overlay visualizations of co-authorship by country (VOSviewer data analysis, 2023)

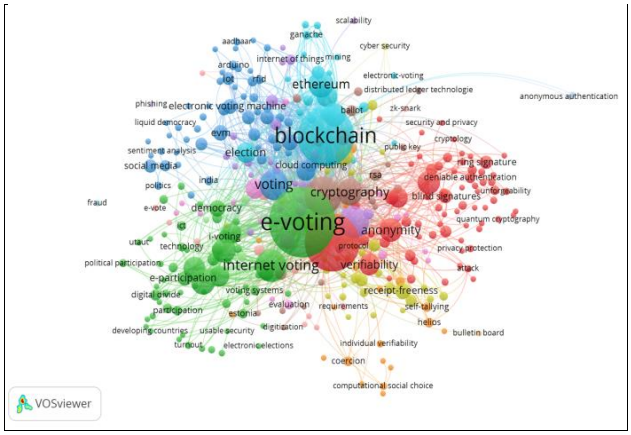

Figure 7. Analysis of network visualization of author keywords (VOSviewer data analysis, 2023)

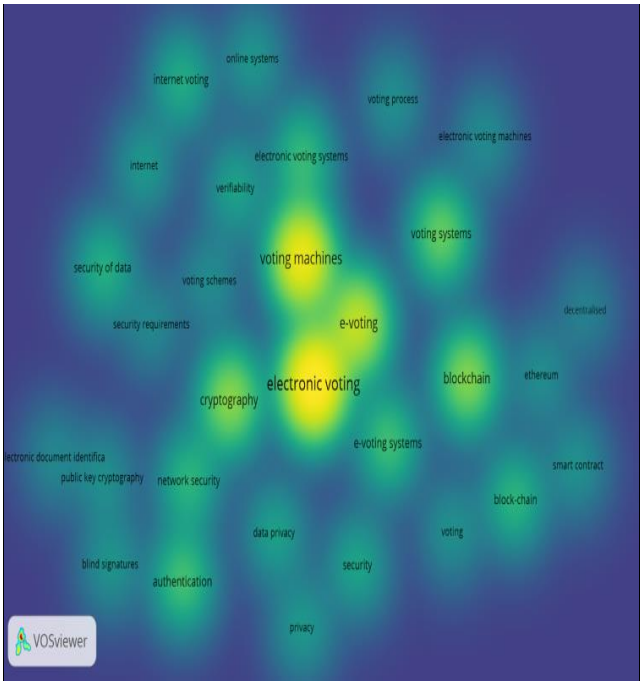

Figure 8. Analysis of density visualization of all keywords (VOSviewer data analysis, 2023)

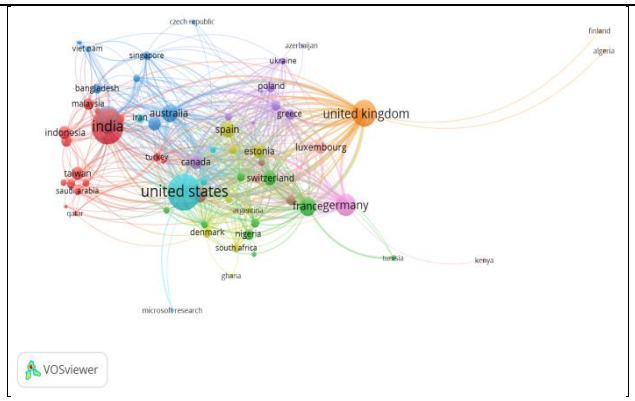

Figure 9. Network visualization of country-level collaboration among authors (VOSviewer data analysis, 2023)

The result was extracted from the overlay visualization by selecting coauthorship as the type of analysis and countries as the units of analysis. Based on bibliographic data from VOSviewer, the maximum number of countries per document was set to 25, and the minimum number of countries to be selected was 5. Of the 189 countries, 72 met the thresholds. By analyzing the total link strength for the weight of visualization and the scores of the average publication year, one can discern the relationship between countries in conducting studies related to e-voting, demonstrating that developed countries have a longer history of such research compared to Asian countries. There are 10 clusters and 72 items (countries). However, the most extensive set of connected items consisted of 69 items with 638 links and 1696 total link strengths identified and divided according to different colors and years. According to the analysis, the United States has started doing its research and has the highest link (52) and total link strength of 299 in the average publication year of 2013. The United States has the most vital relationship with the United Kingdom, with 33 linkages, followed by Canada (20) and Germany (19). Australia has the second highest number of links, with 46 (196 total link strength) and 139 documents, with an average publication year of 2016. The United Kingdom (Cluster 7) has 48 linkages out of 332 documents, with total link strength of 303 and an average publication year 2014 (Figure 6).

In addition to the United States, the United Kingdom demonstrates a substantial research total link strength, with researchers from France (31 links), Germany (23 links), Australia (19 links), and Luxembourg (18 links). Reen and Gochhait (2020) conducted a bibliometric analysis of electronic voting using the WoS database. A study indicated that the United States contributed the highest number of research papers. China also exhibits relatively high total link strength with Australia, comprising 17 links. The study also revealed that out of the ASEAN nations, only China produces as much paper as Europe (Reen & Gochhait, 2020). At the same time, Garcés-Giraldo et al. (2023) used Scopus as a data source to carry out a study using bibliometric analysis to examine the annual pattern of publications in the field of the IoT, which did not concur with the research by Reen and Gochhait (2020). The study covered a period of 14 years, from 2009 to 2022. Asian nations also

demonstrate robust connections with other developed countries; however, their aggregate link strength remains comparatively low, considering that these nations established significant connections between 2018 and 2020. This is because Taiwan has total link strength of 15 and an average publication year as early as 2010, compared to other Asian countries.

Ghana was among the countries that produced documents between 2020 and 2021, while Saudi Arabia, Pakistan, Indonesia, India, and Iraq also produced documents and had links with many other countries. The distances between the clusters on the map and the lines connecting them reveal the strength of the ties between nations and the frequency of their coauthorship publications. Researchers conducted extensive investigations into intelligent information systems and cybersecurity in 2021 (Garcés-Giraldo et al., 2023). Regarding coauthorship cooperation, the study indicates the strength of international cooperation in biometric voting using the IoT to transfer votes to a central research system. Amrutkar et al. (2021) conducted an analysis using the WoS database and revealed an increase in the number of publications on new blockchain-based electronic voting systems since 2017.

The researchers utilized keywords to characterize the content of their publications. These keywords are searchable for each article in the ISI record (1991 data onward, depending on the database). VOSviewer uses data from bibliographic records to generate visual results (Figure 7). Employing network visualization and co-occurrence analysis as the analytical units for search, we identified and extracted 5,868 keywords from the database. However, a maximum of 357 keywords were selected for analysis. The author's top keyword is "e-voting," with 701 occurrences, 280 links, and total link strength of 1649.

In addition, “electronic voting" has 472 occurrences but lower total link strength of 968 compared to “blockchain,” which has only 497 occurrences but total link strength of 1379. This is because the term “blockchain” has been widely used, and various domains, including voting and election reform, have utilized blockchain technology. Blockchain is a system that uses a distributed transactional database that incorporates cryptographic security and consensus processes (Yli-Huumo et al., 2016).

The term "security" appears 209 times, "privacy" appears 147 times, and "voting" appears 131 times. Although the number of occurrences for specific keywords like "Ethereum," "e-government”, "elections," “smart contracts," and “e-democracy” mentioned in the lists as part of the research that has been done in the fields of computer studies and political science was low, the total link strength for those keywords was still high (100 and above). The keywords “political participation” and “e-participation” can also be related to voting turnout and political participation. Authors always use the terms "online voting," "transparency," "encryption," and "e-voting system" because they accurately describe the subject they are discussing, which is the use of electronic technology for casting and counting votes in an election. Academic and professional communities use "standard terminology" to describe this topic.

Furthermore, using keywords like "e-voting" or "electronic voting" can help authors ensure that their work is easily discoverable by others searching for information on this topic. It is crucial in the digital age because an immense amount of information is accessible online. Efficient search engine optimization (SEO) is essential to ensure the widespread dissemination and citation of research. The authors use keywords to describe and discuss electronic voting effectively, making their work accessible to everyone. Electronic voting represents all important IoT, computer science, and engineering elements.

This research maps all keywords provided using VOSviewer. All keywords were mapped, and Figure 8 shows the degree of density of specific keywords based on the colors represented. VOSviewer analysis revealed high-density keywords. The number of selected keywords is 30. This number was selected from the 1,193 keywords that met the threshold, having been filtered from 13,542. The 30 items comprise 418 links and 18,390 total link strengths. The clear density visualization of all keywords, when we search by selecting co-occurrence as the type of analysis and all keyword terms in the unit of analysis, is electronic voting, with 1906 occurrences and 5222 total link strengths. A higher intensity of the color representing the item indicates a greater number of researchers who conducted studies related to the topic area.

The terms voting machines (1413 occurrences), e-voting (961 occurrences), and blockchain (644 occurrences with 2564 total link strength) all have a clear density visualization and are widely discussed topics. All of the above terms have an obvious connection, eventually leading to a recurring term: blockchain, voting systems, and e-voting systems. There is a belief that blockchains have the potential to be used in the development of effective voting systems or that a blockchain can serve as a crucial element of hybrid electronic voting systems (Bradbury, 2014). Next, some words have a significant density due to the scattering of colors from the main keywords: cryptography, voting systems, blockchains, and e-voting systems. The establishment of robust interrelationships and density among all keywords can lead to substantive, novel research in the field of electronic voting. Keywords like “internet voting” and “voting systems” can serve as references for future studies.

A network of country collaborations among authors from different countries on e-voting studies was extracted using VOSviewer (Figure 9).

It is analyzed after extracting data from the type of analysis—co-authorship and unit of analysis—by countries based on bibliographic data. According to the

analysis, the country at the top of the ranking due to the total number of documents produced (607 documents) but with the most cited documents (10,144 citations) is the United States of America, followed by the United Kingdom (332 documents) with 5304 citations. China has 344 documents and more citations (2876) than India (2800), with 590 documents. Essah and Ampofo (2023) conducted a study on biometric voting using an IoT system, which aligns with the above analysis.

They performed bibliometric analysis using Scopus. They found that the number of publications on these topics (information systems and cybersecurity) has been consistently increasing from 2015 to 2021.

Thus, in 2021, China achieved the most significant number of publications, citations, and total link strength in intelligent information systems and cybersecurity.

In this analysis, something fascinating about Australia is revealed. Although the number of documents is low (139), the number of citations is relatively high (2243). However, international collaboration on e-voting is prominent, with 1696 total link strengths. As a result of the technological advancements possessed by these economic and political entities, developing Asian nations, such as Malaysia, Indonesia, and Singapore, regard the United States as a model. Furthermore, employing a global language allows academics worldwide to use publications from that country as references easily. The majority of author collaborations occur in the same geographical area, particularly among Asian countries, which are still convenient for collaborating with like-minded countries in terms of acceptance and application of e-voting in their elections, as well as the number of researchers who conduct e-voting studies.

7. Conclusion

This bibliometric study identified trends and characteristics of publications in Scopus-indexed journals, revealing a rapid increase in articles related to e-voting from 2005 to 2023. This significant transformation has occurred because individuals globally continue to explore alternative methodologies that can be implemented in the voting process. It is anticipated that these efforts will address various obstacles that have discouraged voter participation during general elections. The results of this study also found that the authoring of articles by Asian countries such as China, India, and Taiwan began to demonstrate an increasing trend as a result of technological developments that enabled an in-depth investigation of the usability of the internet in elections to be carried out in other countries besides the West. Trend analyses reveal patterns in citations, including papers from many countries. Based on the analysis of the data, the documents that received the highest number of citations were predominantly articles and studies produced by authors from Western countries, in comparison to those by Asian authors. This disparity is likely attributable to the fact that, in contrast to articles and studies produced by Western scholars since the 1970s and 1980s, research on e-voting still requires more extensive dissemination and readership. Furthermore, the majority of nations that have transitioned to electronic voting electoral systems are predominantly developed countries. Through an examination of the distribution of publications across countries, the study could pinpoint regions that require more research in this area (Elfattal et al., 2023).

This knowledge is essential for guiding future research endeavors and ensuring a comprehensive understanding of e-voting in diverse contexts. Through an analysis of the quantity and regional distribution of publications, this study provides valuable insights into the changing levels of interest and research focus on e-voting worldwide.

The data retrieved from the document index in the Scopus database comprised journals, books, conference papers, conference reviews, review articles, book chapters, notes, letters, editorials, short surveys, and retracted sources. The quantity of documents produced since 1970 has become the initial reference point, influencing the trajectory of research advancement. Since then, the number of publications has increased annually. The graph also reveals that the number of articles on e-voting peaked in the late 2000s, particularly between 2019 and 2021. The results of the data analysis in the form of bibliometrics revealed several findings from various perspectives: (a) there exists a segmentation in terms of the number of publications of study materials in Scopus-indexed journals, wherein Asian countries are still at the stage of studying and assessing the use of e-voting in elections compared to Western countries that have previously implemented e-voting methods in their election systems; (b) time, financial resources, human effort, and other unforeseen factors, such as the pandemic, prompted the conceptualization of a voting system capable of overcoming the aforementioned constraints; (c) the results of the study can serve as a valuable indicator for countries worldwide to consider an alternative method that is more accessible and has a positive impact on voter turnout, particularly among young people in the country; (d) the potential to develop a research model that more explicitly delineates the social mobilization and ethical aspects of technology utilization in the effort to introduce e-voting to the election system.

In accordance with this, the results of this study provide an opportunity for further research that examines the enhancement of the e-voting system in terms of technology (i.e., blockchain and the IoT) and its potential impact on political engagement (voter turnout) and investigating unforeseen scenario factors as one of the considerations for governments, particularly in developing countries that have not yet implemented e-voting, to evaluate more reliable e-voting proposals for the sustainability of the democratic system.

8. Limitations and Further Study

The study suggests that future investigations should broaden their scope beyond the Scopus database and encompass additional recognized databases such as

WoS, Springer, and IEEE Xplore. Implementing this approach would improve the thoroughness and strength of the bibliometric study by encompassing a broader spectrum of publications and citations. This research emphasizes the interdisciplinary aspect of e-voting, using knowledge from several domains, including information technology, political science, and public administration. This viewpoint promotes interdisciplinary collaboration to address multifaceted challenges related to voting systems.

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Data Availability Statement

The data presented in this study are available on request from the corresponding authors.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

Author Contributions

KABR contributed to the design and implementation of the research, BTV to the analysis of the results and to the writing of the manuscript. RBT conceived the original and supervised the project.

References

[1] AGBESI, S., BUDURUSHI, J., DALELA, A., & KULYK, O. (2023). Investigating Transparency Dimensions for Internet Voting. In: VOLKAMER, M., DUENAS-CID, D., RØNNE, P., RYAN, P.Y.A., BUDURUSHI, J., KULYK, O., RODRIGUEZ PÉREZ, A., & SPYCHER-KRIVONOSOVA, I. (eds.) *Electronic Voting.* Cham: Springer, pp. 1–17. https://doi.org/10.1007/978-3-031-43756-4_1

[2] AMRUTKAR, D., DONGARE, G., SONUNE, S., & CHAUDHARI, A.Y. (2021). E-Voting Systems Using Blockchain: A Systematic Review and Future Research Direction. *EPRA International Journal of Research & Development*, 6(5), 413–423. https://doi.org/10.36713/epra7157

[3] ANITHA, V., CARO, O.J.M., SUDHARSAN, R., YOGANANDAN, S., & VIMAL, M. (2023). Transparent voting system using blockchain. *Measurement Sensors*, 25, 100620. https://doi.org/10.1016/j.measen.2022.100620

[4] BAAS, J., SCHOTTEN, M., PLUME, A.M., COTE, G., & KARIMI, R. (2020). Scopus is a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, 1(1), 377–386. https://doi.org/10.1162/qss_a_00019

[5] BEDERSON, B.B., LEE, B., SHERMAN, R.M., HERRNSON, P.S., & NIEMI, R.G. (2003). Electronic voting system usability issues. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Ft. Lauderdale, Florida, 5-10 April 2003, pp. 145–152. https://doi.org/10.1145/642611.642638

[6] BRADBURY, S. (2014). *The Evolution of the Microscope*. Elsevier. Retrieved from http://books.google.ie/books?id=1bGRBQAAQBAJ&printsec=frontcover&dq=Bradbury+2014&hl=&cd=4&source=gbs_api

[7] DEBNATH, S., KAPOOR, M., & RAVI, S. (2017). The Impact of Electronic Voting Machines on Electoral Frauds, Democracy, and Development. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3041197

[8] DELOITTE NEDERLAND (2016). *Blockchain technology: 9 benefits & 7 challenges*. Retrieved from https://www2.deloitte.com/nl/nl/pages/innovatie/artikelen/blockchain-technology-9-benefits-and-7-challenges.html

[9] DONTHU, N., KUMAR, S., & PATTNAIK, D. (2020). Forty-five years of Journal of Business Research: A bibliometric analysis. *Journal of Business Research*, 109, 1–14. https://doi.org/10.1016/j.jbusres.2019.10.039

[10] DONTHU, N., KUMAR, S., PATTNAIK, D., & LIM, W.M. (2021). A bibliometric retrospection of marketing from the lens of psychology: insights from psychology & marketing. *Psychology & Marketing*, 38(5), 834–865. https://doi.org/10.1002/mar.21472

[11] ELFATTAL, S., AWAD, M., & BEN ABDERRAHMEN, S. (2023). E-Voting in Literature: Analyzing Nations' Interest. Proceedings of the Central and Eastern European eDem and eGov Days, Budapest, 14-15 September 2023, pp. 41–46. https://doi.org/10.1145/3603304.3603340

[12] ESSAH, R., & AMPOFO, I.A.S. (2023). A Bibliometric Overview of IoT-Based Digital Voting. *Asian Journal of Research in Computer Science*, 15(3), 10–23. https://doi.org/10.9734/ajrcos/2023/v15i3321

[13] FAROOQ, M.S., IFTIKHAR, U., & KHELIFI, A. (2022). A Framework to Make Voting Systems Transparent Using Blockchain Technology. *IEEE Access*, 10, 59959–59969. https://doi.org/10.1109/access.2022.3180168

[14] GARCÉS-GIRALDO, L., PATIÑO-VANEGAS, J., ESPINOSA, R., BENJUMEA-ARIAS, M., VALENCIA-ARIAS, A., & LAMPEN, M.C. (2023). Internet of Things - IoT research trends from a

bibliometric analysis. *Journal of Information Systems Engineering & Management*, 8(1), 18894. https://doi.org/10.55267/iadt.07.12739

[15] GLASS, P. (2016). *How secure is blockchain?* Retrieved from https://www.taylorwessing.com/download/article-how-secure-is-block-chain.html

[16] HARZING, A.W., & ALAKANGAS, S. (2015). Google Scholar, Scopus, and the Web of Science: a longitudinal and cross-disciplinary comparison. *Scientometrics*, 106(2), 787–804. https://doi.org/10.1007/s11192-015-1798-9

[17] KAMRAN, M., KHAN, H.U., NISAR, W., FAROOQ, M., & REHMAN, S.U. (2020). Blockchain and the Internet of Things: A bibliometric study. *Computers & Electrical Engineering*, 81, 106525. https://doi.org/10.1016/j.compeleceng.2019.106525

[18] KHAN, M.A., PATTNAIK, D., ASHRAF, R., ALI, I., KUMAR, S., & DONTHU, N. (2021). Value of special issues in the journal of business research: A bibliometric analysis. *Journal of Business Research*, 125, 295–313. https://doi.org/10.1016/j.jbusres.2020.12.015

[19] KOHNO, T., STUBBLEFIELD, A., RUBIN, A.D., & WALLACH, D.S. (2004). Analysis of an electronic voting system. Proceedings of the IEEE Symposium on Security and Privacy, Berkeley, California, 12-12 May 2004, pp. 27–40. https://doi.org/10.1109/SECPRI.2004.1301313

[20] KURTZ, M.J., & BOLLEN, J. (2010). Usage bibliometrics. *Annual Review of Information Science and Technology*, 44(1), 1–64. https://doi.org/10.1002/aris.2010.1440440108

[21] KUZIOR, A., & SIRA, M. (2022). A Bibliometric Analysis of Blockchain Technology Research Using VOSviewer. *Sustainability*, 14(13), 8206. https://doi.org/10.3390/su14138206

[22] MCBURNEY, M.K., & NOVAK, P.L. (2002). What is bibliometrics and why should you care? Proceedings of the IEEE International Professional Communication Conference, Portland, Oregon, 20 September 2002, pp. 108–114. https://doi.org/10.1109/IPCC.2002.1049094

[23] NAKAMOTO, S. (2019). *The White Paper*. Ignota Books.

[24] NEWS24 (2019). E-voting: Which countries use it, where has it failed, and why? *Irish Sun.* Retrieved from https://www.irishsun.com/news/260976022/e-voting-which-countries-use-it-where-has-it-failed-and-why

[25] OOSTVEEN, A.M., & VAN DEN BESSELAAR, P. (2004). Internet Voting Technologies and Civic Participation: The Users' Perspective. *Javnost - The Public*, 11(1), 61–78. https://doi.org/10.1080/13183222.2004.11008847

[26] QIU, J.P., DONG, K., & YU, H.Q. (2014). Comparative study on structure and correlation among author co-occurrence networks in bibliometrics. *Scientometrics*, 101(2), 1345–1360. https://doi.org/10.1007/s11192-014-1315-6

[27] RAJAKUMAR, G., DU, K.-L., VUPPALAPATI, C., & BELIGIANNIS, G.N. (eds.) (2023). *Intelligent Communication Technologies and Virtual Mobile Networks: Proceedings of ICICV 2022.* Singapore: Springer. https://doi.org/10.1007/978-981-19-1844-5

[28] RAVI, S. (2019). How electronic voting machines have improved India's democracy. *Brookings.* Retrieved from https://www.brookings.edu/articles/how-electronic-voting-machines-have-improved-indias-democracy/

[29] REEN, T.S., & GOCHHAIT, S. (2020). Electronic voting research papers in Web of Science: A bibliometric analysis. *European Journal of Molecular and Clinical Medicine*, 7(6), 2369–2379. Retrieved from http://www.ejmcm.com/issue-content/electronic-voting-research-papers-in-web-of-science-a-bibliometric-analysis-9843

[30] RIVEST, R.L. (2006). *The ThreeBallot Voting System.* Retrieved from https://people.csail.mit.edu/rivest/pubs/Riv06c.pdf

[31] SEGEV, E. (ed.) (2021). *Semantic network analysis in social sciences.* London, New York: Routledge.

[32] SUPRIANTO, O., & AFFANDI, I. (2020). Student Participation with E-Voting in the Digital Era. Proceedings of the 2nd Annual Civic Education Conference, pp. 222-226. https://doi.org/10.2991/assehr.k.200320.043

[33] TARASOV, P., & TEWARI, H. (2017). The future of e-voting. *IADIS International Journal on Computer Science & Information Systems*, 12(2), 148-165. Retrieved from https://www.iadisportal.org/ijcsis/papers/2017210210.pdf

[34] THIGA, M.M. (2020). Increasing Participation and Security in Student Elections through Online Voting: The Case of Kabarak University. Proceedings of the IST-Africa Conference, Kampala, 18-22 May 2020, pp. 1-7. Retrieved from https://ieeexplore.ieee.org/abstract/document/9144008

[35] THOUTAM, V. (2021). Physical Design, Origins and Applications of IoT. *Journal of Multidisciplinary Cases*, 11, 26–33. https://doi.org/10.55529/jmc11.26.33

[36] VAN ECK, N.J., & WALTMAN, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111(2), 1053–1070. https://doi.org/10.1007/s11192-017-2300-7

[37] YLI-HUUMO, J., KO, D., CHOI, S., PARK, S., & SMOLANDER, K. (2016). Where Is Current Research on Blockchain Technology?—A Systematic Review. *PLoS ONE*, 11(10), e0163477. https://doi.org/10.1371/journal.pone.0163477

[38] ZHU, J., & LIU, W. (2020). A tale of two databases: the use of Web of Science and Scopus in academic papers. *Scientometrics*, 123(1), 321–335. https://doi.org/10.1007/s11192-020-03387-8

参考文:

[1] AGBESI, S.、BUDURUSHI, J.、DALELA, A. 和 KULYK, O. (2023)。调查互联网投票的透明度维度。见：VOLKAMER, M.、DUENAS-CID, D.、RØNNE, P.、RYAN, P.Y.A.、BUDURUSHI, J.、KULYK, O. 、 RODRIGUEZ PÉREZ, A. 和 SPYCHER-KRIVONOSOVA, I.（编辑）电子投票。占婆：施普林格，第 1-17 页。https://doi.org/10.1007/978-3-031-43756-4_1

[2] AMRUTKAR, D.、DONGARE, G.、SONUNE, S. 和 CHAUDHARI, A.Y.（2021）。使用区块链的电子投票系统：系统评价和未来研究方向。EPRA 国际研究与发展杂志，6(5)，413–423。https://doi.org/10.36713/epra7157

[3] ANITHA, V. , CARO, O.J.M., SUDHARSAN, R., YOGANANDAN, S., & VIMAL, M. (2023). 使用区块链的透明投票系统。测量传感器，25，100620。https://doi.org/10.1016/j.measen .2022.100620

[4] BAAS, J.、SCHOTTEN, M.、PLUME, A.M.、COTE, G. 和 KARIMI, R. (2020)。斯高帕斯是定量科学学术研究的精选、高质量文献计量数据源研究。定量科学研究，1(1)，377–386。https://doi.org/10.1162/qss_a_00019

[5] BEDERSON, B.B.、LEE, B.、SHERMAN, R.M.、HERRNSON, P.S. 和 NIEMI, R.G. (2003)。电子投票系统可用性问题。SIGCHI 计算机系统人为因素会议论文集，佛罗里达州劳德代尔堡，2003 年 4 月 5-10 日，第 145-152 页。https://doi.org/10.1145/642611.642638

[6] BRADBURY, S. (2014). 显微镜的演变. 爱思唯尔。摘自 http://books.google.ie/books?id=1bGRBQAAQBAJ&printsec=frontcover&dq=Bradbury+2014&hl=&cd=4&source=gbs_api

[7] DEBNATH, S., KAPOOR, M., & RAVI, S. (2017). 电子投票机对选举舞弊、民主和发展的影响。SSRN 电子期刊。https://doi.org/10.2139/ssrn.3041197

[8] 德勤荷兰 (2016)。区块链技术：9 大优势和 7 大挑战。摘自 https://www2.deloitte.com/nl/nl/pages/innovatie/artikelen/blockchain-technology-9-benefits-and-7-challenges.html

[9] DONTHU, N., KUMAR, S., & PATTNAIK, D. (2020)。《商业研究杂志》四十五年：文献计量分析。《商业研究杂志》，109，1-14。https://doi.org/10.1016/j.jbusres.2019.10。 039

[10] DONTHU, N.、KUMAR, S.、PATTNAIK, D. 和 LIM, W.M. (2021)。从心理学的角度对营销进行文献计量回顾：心理学与营销的见解。《心理学与营销》，38（ 5 ），834–865。https://doi.org/10.1002/mar.21472

[11] ELFATTAL, S. 、 AWAD, M. 和 BEN ABDERRAHMEN, S. (2023)。文献中的电子投票：分析国家利益。中欧和东欧埃德姆和电子政务日，布达佩斯，2023 年 9 月 14-15 日，第 41-46 页。https://doi.org/10.1145/3603304.3603340

[12] ESSAH, R.，& AMPOFO, I.A.S. (2023)。基于物联网的数字投票的文献计量概述。亚洲计算机科学研究杂志，15(3)，10-23。https://doi.org/10.9734/ajrcos/2023/v15i3321

[13] FAROOQ, M.S.、IFTIKHAR, U. 和 KHELIFI, A. (2022)。利用区块链技术实现投票系统透明化的框架。IEEE 访问，10，59959–59969。https://doi.org/10.1109/access.2022.3180168

[14] GARCÉS-GIRALDO, L.、PATIÑO-VANEGAS, J.、ESPINOSA, R.、BENJUMEA-ARIAS, M.、VALENCIA-ARIAS, A., & LAMPEN, M.C. (2023)。物联网-从文献计量分析看物联网研究趋势。信息系统工程与管理杂志，8(1)，18894。https://doi.org/10.55267/iadt.07.12739

[15] GLASS，P.（2016 年）。区块链有多安全？检索自 https://www.taylorwessing.com/download/article-how-secure-is-block-chain.html

[16] HARZING, A.W., & ALAKANGAS, S. (2015). 谷歌学术、斯高帕斯和科学网：纵向和跨学科比较。科学计量学，106（2），787-804。https://doi.org/10.1007/s11192-015-1798-9

[17] KAMRAN, M.、KHAN, H.U.、NISAR, W.、FAROOQ, M. 和 REHMAN, S.U. (2020)。区块链和物联网：文献计量研究。计算机与电气工程，81，106525。https://doi.org/10.1016/j.compeleceng.2019.106525

[18] KHAN, M.A.、PATTNAIK, D.、ASHRAF, R.、ALI，I.，KUMAR，S.，和 DONTHU，N.（2021）。商业研究期刊中特刊的价值：文献计量分析。《商业研究杂志》，125，295–313。https://doi.org/10.1016/j.jbusres.2020.12.015

[19] KOHNO, T.、STUBBLEFIELD, A.、RUBIN, A.D. 和 WALLACH, D.S. (2004)。电子投票系统分析。会议记录 IEEE 安全与隐私研讨会，加利福尼亚州伯克利，2004 年 5 月 12-12 日，第 27-40 页。https://doi.org/10.1109/SECPRI.2004.1301313

[20] KURTZ, M.J.，& BOLLEN, J.（2010 年）。使用文献计量学。《信息科学与技术年度评论》，44(1)，1-64。https://doi.org/10.1002/aris.2010.1440440108

[21] KUZIOR, A., & SIRA, M. (2022). 使用 VOS 查看器对区块链技术研究进行文献计量分析。可持续性，14(13)，8206。https https://doi.org/10.3390/su14138206

[22] MCBURNEY, M.K. 和 NOVAK, P.L. (2002)。什么是文献计量学，为什么要关心它？IEEE 国际专业通信会议论文集，俄勒冈州波特兰，2002 年 9 月 20 日，第 108-114 页。https://doi.org/10.1109/IPCC.2002.1049094

[23] NAKAMOTO, S. (2019)。白皮书。伊格诺塔图书。

[24] 新闻 24 (2019)。电子投票：哪些国家使用它，在哪里失败了，为什么？爱尔兰太阳报。摘自 https://www.irishsun.com/news/260976022/e-voting-which-countries-use-it-where-has-it-failed-and-why

[25] OOSTVEEN, A.M., & VAN DEN BESSELAAR, P. (2004). 互联网投票技术和公民参与：用户视角。亚夫诺斯特 - 公众，11(1)，61–78。https://doi.org/10.1080/13183222.2004.11008847

[26] QIU, J.P., DONG, K., & YU, H.Q. (2014). 文献计量学中作者共现网络结构与相关性的比较研究。科学计量学，101(2)，1345–1360。https://doi.org/10.1007/s11192-014-1315-6

[27] RAJAKUMAR, G. 、DU, K.-L. 、VUPPALAPATI, C. 和 BELIGIANNIS, G.N. (编辑) (2023)。智能通信技术和虚拟移动网络：ICICV 2022 论文集。新加坡：施普林格。https://doi.org/10.1007/978-981-19-1844-5

[28] RAVI, S. (2019)。电子投票机如何改善印度的民主。布鲁金斯学会。取自 https://www.brookings.edu/articles/how-electronic-voting-machines-have-improved-indias-democracy/

[29] REEN, T.S., & GOCHHAIT, S. (2020). 科学网中的电子投票研究论文：文献计量分析。《欧洲分子与临床医学杂志》，7(6)，2369–2379。取自 http://www.ejmcm.com/issue-content/electronic-voting-research-papers-in-web-of-science-a-bibliometric-analysis-9843

[30] RIVEST, R.L. (2006). 三选票投票系统。取自 https://people.csail.mit.edu/rivest/pubs/Riv06c.pdf

[31] SEGEV, E. (编辑) (2021). 社会科学中的语义网络分析。伦敦、纽约：劳特利奇。

[32] SUPRIANTO, O.，& AFFANDI, I. (2020)。数字时代的学生参与电子投票。第二届年度公民教育会议论文集，第 222-226 页。https://doi.org/10.2991/assehr.k.200320.043

[33] TARASOV, P.，& TEWARI, H. (2017)。电子投票的未来。IADIS 国际计算机科学与信息系统杂志，12(2)，148-165。取自 https://www.iadisportal.org/ijcsis/papers/2017210210.pdf

[34] THIGA, M.M. (2020)。通过在线投票提高学生选举的参与度和安全性：卡巴拉克大学案例。IST-非洲会议论文集，坎帕拉，2020 年 5 月 18 日至 22 日，第 1-7 页。取自 https://ieeexplore.ieee.org/abstract/document/9144008

[35] THOUTAM, V. (2021)。物联网的物理设计、起源和应用。多学科案例杂志，11，26-33。https://doi.org/10.55529/jmc11.26.33

[36] VAN ECK, N.J.，& WALTMAN, L. (2017)。使用网络探索者和 VOS 查看器对出版物进行基于引文的聚类。科学计量学，111(2)，1053-1070。https://doi.org/10.1007/s11192-017-2300-7

[37] YLI-HUUMO, J.、KO, D.、CHOI, S.、PARK, S. 和 SMOLANDER, K. (2016)。区块链技术的当前研究进展如何？——系统评价。公共科学图书馆，11(10)，e0163477。https://doi.org/10.1371/journal.pone.0163477

[38] ZHU, J. 和 LIU, W. (2020)。两个数据库的故事：科学网和斯高帕斯在学术论文中的使用。科学计量学，123(1)，321–335。https://doi.org/10.1007/s11192-020-03387-8