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BLOCKCHAIN TABANLI ELEKTRONİK TİCARET İLE İLGİLİ ÇALIŞMALARIN BİBLİYOMETRİK ANALİZİ

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Öz- *Son zamanlarda blok zinciri teknolojisi, başta finans sistemi olmak üzere birçok alanı etkilemiştir. E ticaret sistemi de bu alanların içerisinde yer almaktadır. Çalışma Dünyada blok zincir tabanlı elektronik ticaret üzerine yapılan araştırmaların bibliyometrik analizidir. Dijitalleşmenin bir sonucu olarak blok zincir teknolojilerinin elektronik ticaret üzerindeki etkileri yapılan araştırmalar açısından incelenmiştir. Araştırma kapsamında öncelikle 2015-2024 yılları arasında web of science veritabanında bulunan blok zincir tabanlı elektronik ticaret ile ilgili 331 adet çalışmaya ulaşılmıştır. Daha sonra çalışmalar; yayın yılı, yazar bilgisi, araştırma alanları, yayın kaynakları, yayın yapılan ülkeler ve yayın dillerine uygun olarak parametrelere göre incelenmiştir. Ayrıca "VOSviewer" programı kullanılarak çalışmaların görsel ağ haritaları oluşturulmuş ve birbirleriyle olan bağlantıları ortaya çıkarılmıştır. Bulgular ise araştırma sonuçlarına göre yıllar itibarıyla incelenen alanda yayınlanan makale sayısı en fazla 2022 yılına ait görülmüştür. Çalışmada anahtar kelimelerin seçiminde bir standardizasyon yoktur. Ayrıca, "VOSviewer" programı kullanılarak çalışmaların görsel ağ haritaları ortaya çıkarılmış ve ilişkileri belirlenmiştir. Bu çalışma, literatürdeki çalışmalardan kapsam ve zaman dilimi açısından farklıdır ve blok zincir tabanlı elektronik ticaret konusunda Web of Science da bulunan uluslararası önemli yayınların analizini içermektedir. Türkiye de ise henüz bu konuyla benzerlik gösteren herhangi bir çalışma mevcut değildir. Bu bağlamda, literatüre katkı sağlaması ve bundan sonraki çalışmalarda kaynak olması önerilebilir.*

Anahtar Kelimeler: *blokzincir, e-ticaret, bibliyometrik analiz*

BIBLIOMETRIC ANALYSIS OF STUDIES RELATED TO BLOCKCHAIN-BASED ELECTRONIC COMMERCE

Abstract- *Recently, blockchain technology has affected many areas, especially the financial system. The e-commerce system is also included in these areas. The study is a bibliometric analysis of research conducted on blockchain-based electronic commerce in the world. As a result of digitalization, the effects of blockchain technologies on electronic commerce were examined in terms of the studies conducted. Within the scope of the research, 331 studies on blockchain-based electronic commerce in the web of science database between the years 2015-2024 were reached. Then, the studies were examined according to the parameters such as publication year, author information, research areas, publication sources, countries of publication and publication languages. In addition, visual network maps of the studies were created using the "VOSviewer" program and their connections with each other were revealed. According to the findings, according to the research results, the number of articles published in the examined field by years was seen to be the highest in 2022. There is no standardization in the selection of keywords in the study. In addition, visual network maps of the studies were created using the "VOSviewer" program and their relationships were determined. This study is different from the studies in the literature in terms of scope and time frame and includes the analysis of important international publications on blockchain-based electronic commerce in Web of Science. There is no study like this topic in Turkey yet. In this context, it can be recommended to contribute to the literature and be a source for future studies.*

Key words: *blockchain, e-commerce, bibliometric analysis*

1.INTRODUCTION

In recent years, electronic commerce has become an important sector with the technological developments experienced globally, changes in consumers' preferences and a period that started with the impact of the Covid 19 pandemic. E-commerce has left physical stores in the background with the benefits it offers to both the buyer and the seller, and unlike traditional businesses, it has also caused some problems to arise. With block chain technology, it is thought that the features of technology such as privacy, security, transparency and auditability can be effective in solving these problems encountered in the e-commerce sector (Keleş,2022;55).

With the new economic order that emerged in the world with the increase in the use of communication technologies and the internet, geographical borders have disappeared, the markets where the seller and the buyer meet have moved to a different dimension and the sellers have accepted the world as a whole customer and have switched to web-based systems in their commercial activities (Civan and Bal, 2002: 1011).

We encounter multiple definitions of electronic commerce. Among these, the World Trade Organization (WTO) defined electronic commerce as follows: electronic commerce is the realization of advertising, sales, marketing and distribution services of goods and services produced by an institution or company by using telecommunication infrastructure (WTO, 1998).In 1996, the United Nations Commission on International Trade Law (UNCITRAL) defined electronic commerce as the exchange of all kinds of data-related communication as a result of commercial activities of institutions in a digital environment through tools and methods such as electronic mail and the Internet (UNCITRAL, 1996:3-4). According to the Organization for Economic Cooperation and Development (OECD), electronic commerce is defined as the trade between individuals and organizations living in countries by transferring files processed in digital format such as voice and text over open or closed network connections (OECD, 2001).
Blockchain is a type of digital ledger in which transactions distributed over a computer network are kept. The blockchain acts as a database, storing records of transactions made over a peer-to-peer network. Thus, these transaction processes become automated, eliminating the need for other third parties and providing a secure, transparent transaction record (Matthew, 2022: 46).

The definitions of the elements that make up the blockchain technology are as follows (Lin and Liao, 2017: 653):
- Decentralization: The main feature of blockchain technology is that transactions are distributed in a recordable, storable way, without being connected to a central system.
- Transparency: Every data recorded between blockchains is transparent and viewable by everyone.
- Open Source: The blockchain system is open to everyone and can be viewed by anyone.
- Independence: Thanks to blockchain technology, data can be transferred securely without the need for a centralized structure.
- Immutability: Records added to blockchains cannot be deleted or updated and are permanently stored forever.
- Privacy: In a blockchain system, data is transferred anonymously. For this transfer to take place, it is sufficient to know the block chain address of the person

Bibliometrics is the citation of the effects of scientific publications on the scientific branch of science (King, 1987: 261). Another definition is "the method of numerically analyzing the publications put forward by institutions or individuals in a specified field in a specified period and in a specified place, and the relationships between these publications." (Yöndemli, 2022) Bibliometric analysis is done in two ways: science mapping technique and performance analysis. In this study, the mapping technique was applied. The analyzes performed within the scope of mapping are as follows (Donthu et al., 2021):
Citation Analysis: Relationships between publications are revealed and the most influential publications are identified. Co-citation Analysis: The main themes and relationships between cited publications are revealed. Bibliographic Coupling: Periodic and existing themes and relationships between cited publications are identified. Co-word Analysis: Written content (words) is analyzed as written content (words) between the subjects and future relationships. Co-authourship Analysis: Relationships between authors, social interactions, and author-author connections (country, institution, etc.) are analyzed.
In this research, citation analysis, co-citation analysis, co-author analysis and bibliographic match analysis from scientific mapping techniques were carried out using VOSviewer software program by examining the relationships between the data obtained from the WoS database. (Öztürk, 2022)
The aim of the research is the bibliometric analysis of studies on blockchain-based electronic commerce in the world. Within the scope of the research, firstly, data on 331 studies on blockchain-based electronic commerce in the web of science database between 2015-2024 were obtained. Then, the related studies were analyzed according to parameters such as publication year, author information, research areas, publication sources, countries of publication and publication languages. In addition, visual network maps of the studies were created using the "VOSviewer" program and their connections with each other were revealed.

2.LITERATURE

In the study, there is no publication on block chain application in electronic commerce in the national literature, therefore, a literature study was conducted in the international literature. When the international studies are analysed, these studies;
In their 2019 study, Jiang et al. created a privacy-preserving business protocol model using private smart contracts in the negotiation phase to protect customer privacy, which is one of the biggest problems in the e-commerce environment. To understand the applicability of the model, extensive analysis was conducted to evaluate the performance of existing blockchain development platforms, Ethereum Quorum and SERO.

In their 2019 study, Liu and Li developed a new way for us to use blockchain technology to solve the problem of product traceability in the supply chain, focusing on cross-border e-commerce to develop blockchain-based information models for products and transactions. In later studies, they aimed to create new models using this model they developed.

Yang et al., in their study in 2019, focused on the reliability of e-commerce purchases and developed a blockchain-based model for this purpose.

In Gao's 2019 study, a data encryption algorithm based on blockchain technology was created, targeting the weak encryption effect existing in the data encryption algorithm of the e-commerce platform and the easy loss and corruption of data after encryption. Two related technologies, digital envelopes, and message authentication are analyzed to ensure the authenticity of data and one-time encryption of data.
Shen et al, 2020, first derived the main improvement factors for the new ecosystem based on blockchain through previous research on cross-border e-commerce and expert interviews. It then explored the use of blockchain's core technology of decentralization, anti-counterfeiting traceability, consensus mechanism, smart contract, and other tools to overcome the bottleneck of cross-border e-commerce development between Korea, China and Japan.

In their 2020 study, Lahkani et al. created a blockchain solution to the global B2B (Business-to-Business) supply chain to increase the profitability and competitiveness of e-commerce companies. They argue that this method increases the speed of payment and the reliability and transparency of data transfer. They said that the method can be developed to focus on the use of blockchain in green logistics to improve environmental sustainability in the e-commerce supply chain.

In their 2021 study, Bella et al. created an ontology package that models representative entities of the digital commerce ecosystem, such as traded commercial participants and assets, using the Ethereum blockchain. The study discusses the project by providing insight into the approach and best practices adopted by the development team.

In their 2021 study, Lee and Yeon addressed the creation of a system that can help overcome information uncertainty and asymmetry in the e-commerce environment and revealed that losses can be prevented with the help of a pilot test that provides end customers with access to detailed and comprehensive product information.
In his study in 2021, Wang addressed the problems arising in Dongguan cross-border e-commerce and examined the effects of blockchain technology to solve the logistical dilemma, cross-border payment and product quality control problems that hinder its development.
In their 2021 study, Zhou et al. developed a blockchain-based decentralized trustworthy reputation system in e-commerce environment, i.e. online shopping, different from the traditional centralized reputation system, considering that the reputation scores of sellers in e-commerce are important in helping consumers purchase satisfactory products.

Deng et al, 2021, analyzes the challenges faced by current e-commerce and discusses the creation of a new e-commerce infrastructure enabled by blockchain.
Xiao et al. in their study in 2022, with the rapid development of e-commerce systems, the centralized service model is increasingly failing to meet the needs of SMEs and faces many risks. To solve these problems, they proposed a blockchain-based decentralized e-commerce transaction system in their study.
Zhou and Liu in their study in 2022 conducted a systematic review on blockchain-enabled cross-border e-commerce supply chain management using a bibliometric data-driven analysis. All relevant publications from the Web of Science database between 2013 and 2021 were collected as research samples. Moreover, VosViewer was used to conduct network and common vocabulary study by visualizing the collaborative relationships of the sampled literatures.

Xing et al., 2022, through a comprehensive literature review, identified four main challenges in the current cross-border e-commerce supply chain field. Feasibility reports were created to demonstrate the feasibility of blockchain technology to improve cross-border e-commerce supply chain activities. Four strategic recommendations are then presented to better promote the application of blockchain technology in cross-border e-commerce.

In their study in 2023, Taherdoost and Madanchian reviewed the existing literature from 2017 to 2022 and examined the research on blockchain-based e-commerce with a focus on issues. Although the application of blockchain in e-commerce is still in its early stages, they found that this will reduce the risk of fraud.
In his study in 2023, Yue analyzed the pitfalls and existing solutions for cross-border e-commerce in agricultural products, highlighting the root causes of information asymmetry, trust issues and regulatory gaps. Then, based on the characteristics of cross-border trade in agricultural products, a blockchain technology-based optimization model for cross-border e-commerce in agricultural products is proposed.

3.RESEARCH METHODOLOGY

The study is a bibliometric analysis of studies on blockchain-based e-commerce in the world. In the research, firstly, data on 331 studies on blockchain-based e-commerce in the web of science database between 2015-2024 were obtained. Then, Vosviewer program, which is considered as one of the programs that provides visualization, mapping and multidimensional analysis, which allows in-depth analysis of data sets, which is considered to provide convenience to researchers in discovering new concepts, evolutions and relationships in the literature, was used due to its strengths in terms of functionality. In this study, the Web of Science database was used, which uses a number of control mechanisms with advanced search indicators for advanced data analysis.

3.1. Collection of Data

The data for this study were obtained from the Web of Science (WoS) database. The articles published in the journals examined in the citation indexes in the WoS database are widely accepted in the academic community and as a result, this database is frequently used in bibliometric analyses. For these reasons, the WoS database was used for literature review and analysis in this study. The data collection process used in the research is as follows:

Database = Web of Science;
Search Term = "blockchain-based e-commerce"
Filtering = Initially, 331 studies were reached, all articles in this range including the years 2015-2024 were included in the study.
Dataset = Consisting of 331 studies,
Dataset Download = June 25, 2024.

FINDINGS

Table 1: Distribution of Studies by Year and Percentage

Publication Years	Record Count	% of 331	Publication Years	Record Count	% of 331
2024	10	3.021	2019	30	9.063
2023	61	18.429	2018	25	7.553
2022	77	23.263	2017	6	1.813
2021	68	20.544	2016	1	0.302
2020	52	15.710	2015	1	0.302

Table 1 shows the distribution and percentage distribution of studies on blockchain-based e-commerce according to years. As shown in the figure, when the studies on blockchain-based e-commerce in the Web of Science database are examined, it is seen that the most studies were conducted in 2021 and 2022. When the table is examined, the most studies were conducted in 2022 with 77 and 23.263%. In 2021, 68 and 20.544% publications and in 2023, an increase was observed between years with 61 publications and 18.429% as a percentage.

Table 2: Distribution and Percentages of Studies According to Authors

Authors	Record Count	% of 331	Authors	Record Count	% of 331
Abolhasan M	2	0.604	Liu XY	3	0.906
Chang SY	5	1.511	Liu Y	4	1.208
Chen YC	3	0.906	Liu ZY	3	0.906
Choi TM	3	0.906	Nakashima M	3	0.906
Fan WJ	4	1.208	Wang F	3	0.906
Ferrer-gomila JL	6	1.813	Wang HJ	3	0.906
Hinarejos MF	6	1.813	Wu B	3	0.906
Huang GQ	3	0.906	Wu Y	3	0.906
Kim I	4	1.208	Wuthier S	4	1.208
Kim J	6	1.813	Zhang L	4	1.208
Li M	6	1.813	Zhang Y	3	0.906
Li YS	4	1.208	Zhou XB	4	1.208
Liang X	3	0.906			

When the distribution and percentages of international studies on blockchain-based e-commerce by authors are analyzed in Table 2, the top 25 authors who have done the most studies on blockchain-based e-commerce are included. Accordingly, the authors who did the most studies were Ferrer-gomila JL, Hinarejos MF, Kim J and Li M with 6 works. After that, the authors with the highest number of works were Chang SY with 5 works in 2nd place and Fan WJ, Kim I, Li YS, Wuthier S, Zhang L and Zhou XB with 4 works each. The percentage share of the authors with the most works among the authors was 1.813%.

Table 3: Distribution of Studies According to Research Areas

Research Areas	Record Count	% of 331	Research Areas	Record Count	% of 331
Computer Science	209	63.142	Neurosciences Neurology	5	1.511
Engineering	93	28.097	Chemistry	4	1.208
Tele communications	66	19.940	Materials Science	4	1.208
Business Economics	61	18.429	Government Law	3	0.906
Science Technology Other Topics	23	6.949	Instruments Instrumentation	3	0.906
Operations Research Management Science	19	5.740	Social Sciences Other Topics	3	0.906
Environmental Sciences Ecology	18	5.438	Agriculture	2	0.604
Mathematics	10	3.021	Energy Fuels	2	0.604
Physics	7	2.115	Psychology	2	0.604
Automation Control Systems	6	1.813	Public Environmental Occupational Health	2	0.604
Information Science Library Science	6	1.813	Robotics	2	0.604
Transportation	6	1.813	Communication	1	0.302
Mathematical Computational Biology	5	1.511			

In Table 3, when the research areas of international studies on blockchain-based e-commerce are examined, it is seen that the highest number of studies was carried out in the field of Computer Science with a rate of 63.142% in 209 times. This figure and percentage is quite high among other fields of study. This research area is followed by Engineering with 93 times and 28.097% and Telecommunications with 66 times and 19.940%.

Table 4: Distribution of Studies According to the Sources of Publication

Publication Titles	Record Count	% of 331	Publication Titles	Record Count	% of 331
IEEE ACCESS	11	3.323	ELECTRONICS	4	1.208
SUSTAINABILITY	11	3.323	JOURNAL OF THEORETICAL AND APPLIED ELECTRONIC COMMERCE RESEARCH	4	1.208
WIRELESS COMMUNICATIONS MOBILE COMPUTING	10	3.021	COMMUNICATIONS IN COMPUTER AND INFORMATION SCIENCE	3	0.906
LECTURE NOTES IN COMPUTER SCIENCE	9	2.719	HELIYON	3	0.906
SECURITY AND COMMUNICATION NETWORKS	7	2.115	INDUSTRIAL MANAGEMENT DATA SYSTEMS	3	0.906
COMPUTERS INDUSTRIAL ENGINEERING	6	1.813	INTERNATIONAL JOURNAL OF ADVANCED COMPUTER SCIENCE AND APPLICATIONS	3	0.906
ELECTRONIC COMMERCE RESEARCH AND APPLICATIONS	6	1.813	PROCEEDINGS OF EIGHTEENTH WUHAN	3	0.906
INTERNATIONAL CONFERENCE ON E BUSINESS ENGINEERING	6	1.813	INTERNATIONAL CONFERENCE ON E BUSINESS ADVANCED COMPUTER SCIENCE AND APPLICATIONS	3	0.906
MOBILE INFORMATION SYSTEMS	6	1.813	TRANSPORTATION RESEARCH PART E LOGISTICS AND TRANSPORTATION REVIEW	3	0.906
2018 IEEE 15TH INTERNATIONAL CONFERENCE ON	5	1.511	2018 4TH INTERNATIONAL CONFERENCE ON ENVIRONMENT	2	0.604

E BUSINESS ENGINEERING ICEBE 2018			AL SCIENCE AND MATERIAL APPLICATION		
2021 2ND INTERNATIONAL CONFERENCE ONE COMMERCE AND INTERNET TECHNOLOGY ECIT 2021	5	1.511	2022 IEEE INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING BIG DATA AND ALGORITHMS EEBDA	2	0.604
ADVANCES IN E BUSINESS ENGINEERING FOR UBIQUITOUS COMPUTING	5	1.511	ACM TRANSACTIONS ON INTERNET TECHNOLOGY	2	0.604
COMPUTATIONAL INTELLIGENCE AND NEUROSCIENCE	5	1.511			
LECTURE NOTES ON DATA ENGINEERING AND COMMUNICATIONS TECHNOLOGIES	5	1.511			

As a result of the examination of the studies in Table 4 according to the sources in which they were published, it was determined that the most published sources in the international arena on the subject of blockchain-based e-commerce were Ieee Access and Sustainability with 11 times and 3.323%, followed by Wireless Communications Mobile Computing with 10 times and 3.021%, and Lecture Notes in Computer Science with 9 times and 2.719%.

Table 5: Distribution of Studies According to Countries of Publication

Countries/Regions	Record Count	% of 331	Countries/Regions	Record Count	% of 331
AUSTRALIA	12	3.625	PAKISTAN	6	1.813
BANGLADESH	6	1.813	PEOPLES R CHINA	188	56.798
CANADA	11	3.323	ROMANIA	4	1.208
EGYPT	3	0.906	SAUDI ARABIA	9	2.719
ENGLAND	9	2.719	SINGAPORE	4	1.208
FRANCE	3	0.906	SOUTH KOREA	22	6.647
GERMANY	8	2.417	SPAIN	10	3.021
GHANA	3	0.906	SWEDEN	4	1.208
GREECE	6	1.813	TAIWAN	16	4.834
INDIA	24	7.251	THAILAND	4	1.208
ITALY	7	2.115	U ARAB EMIRATES	6	1.813
MALAYSIA	4	1.208	USA	36	10.876
NETHERLANDS	5	1.511			

When Web of Science is examined in Table 5, the top 25 countries with the highest number of studies on blockchain-based e-commerce are included. When Table 5 is examined, it is determined that the country with the highest number of studies on block chain-based e-commerce is PEOPLES R CHINA with 188 publications and 56.798%, the second country is USA with 36 numbers and 10.876%, and the third country is INDIA with 24 publications and 7.251%. Again, when Web of Science was analyzed, it was determined that the number of publications on blockchain-based e-commerce in the world was 331 between 2015-2024.

Table 6: Distribution of Studies by Language of Publication

Languages	Record Count	% of 331
Chinese	1	0.302
English	329	99.396
Spanish	1	0.302

When Table 6 is examined, when the publication languages of the studies on blockchain-based e-commerce are analyzed, it is seen that 329 publications and 99.396% of them were prepared in English. This was followed by Chinese and Spanish respectively.

3.2. Co-Authorship of Authors

As a result of the co-authorship analysis, a network map was created with at least 1 study and at least 1 citation criterion to determine the authors who are most connected to each other and who are in collaboration. According to Figure 1, circles of the same color indicate that the authors have collaborative works, the size of the circles indicates the number of publications of the authors, and the lines between the circles indicate the authors who are related to each other. Accordingly, it has been determined that there are 2 clusters and 21 connections in total, in which 9 out of 25 international authors working on blockchain-based e-commerce have collaborated with each other. The 9 most connected authors in the cluster have a total of 21 links in 21 units. The most cited authors are Li, Zipei and

Liu, Zhiyong with 2 sources, 156 citations and 2 total link strength, and Egorova, Mariy with 1 source, 73 citations and 3 total link strength. The authors with the most studies are not among the most connected.

Figure 1: Co-author Links Indicating Collaboration Between Authors

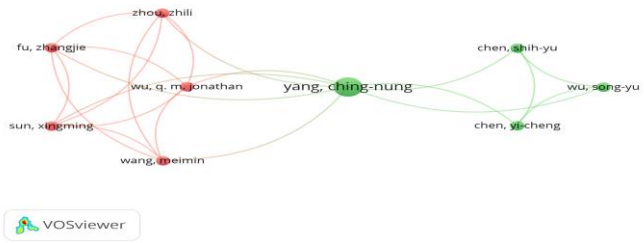
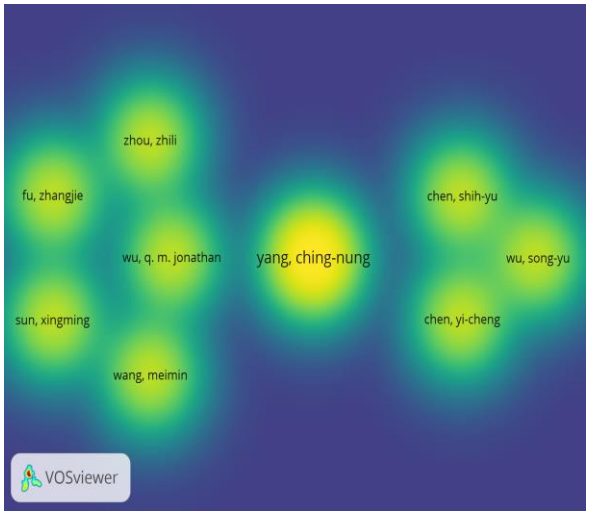


Figure 2. Coauthor Ties density map showing collaboration between authors



3.3. Citation of Authors

To determine the citation networks of the authors, a network map of author citation analysis with at least 1 publication and at least 1 citation criterion was created. Circles of the same color indicate the relationship of the authors, circle sizes indicate the number of citations of the authors, and the lines between the circles indicate the authors who have a citation relationship with each other. Accordingly, 5 clusters and 65 links were identified in total in the analysis of 23 units that were found to be linked to each other from 25 authors who conducted international studies on blockchain-based e-commerce. The most cited authors are Li Zipei and Liu Zhiyong with 2 sources, 156 citations and no link strength, Egorova Mariya with 1 source, 73 citations and 0 total link strength.

Figure 3. Authors' Citation Links

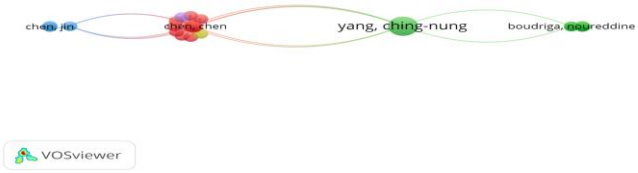
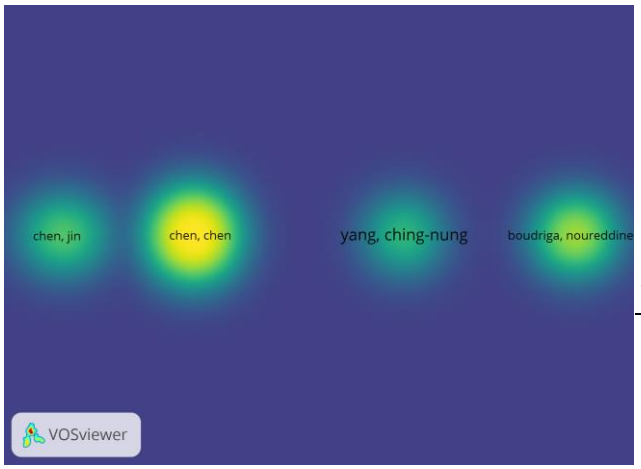


Figure 4. Authors' Citation Ties Density Map

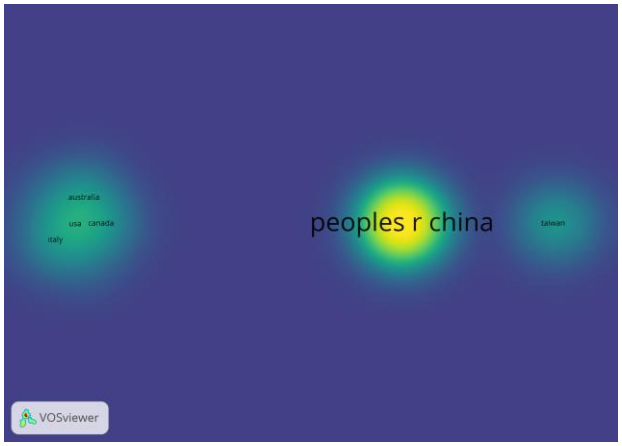


3.4. Citation of Countries

In the context of the scale where a country publishes at least 1 study and receives 1 citation, the analysis of 10 observation units that have a connection between each other was carried out in order to create a network map of the citations received by publications according to their countries. Circles of the same color indicate that countries have studies together, circle sizes indicate the number of publications belonging to countries, and the lines between the circles indicate the countries that are related to each other. Accordingly, out of the 25 countries that have conducted international studies on blockchain-based e-commerce, 10 of them have cooperated with each other, 6 clusters, 9 links and 12 total link strengths have emerged. The most cited countries are the People's Republic of China (37 publications, 544 citations and 6 total link strengths), Austria (1 publication, 58 citations and 1 total link strength) and the USA (2 publications, 56 citations and 1 total link strength).

Figure 5. Citation Ties of Countries

Figure 6. Citation Ties Density Map of Countries

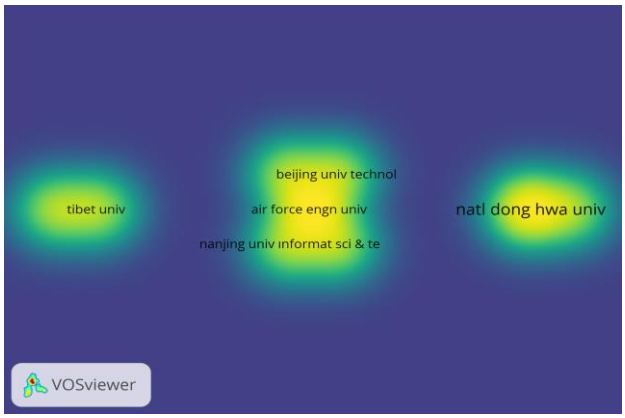


3.5. Citation of Organizations

Circles of the same color show the relationship between institutions, circle sizes show the number of citations of institutions, and the lines between the circles show the institutions that have a citation relationship with each other. Accordingly, in order to create an inter-institutional citation network map, the analysis was carried out through 10 inter-cited observation units with international studies on blockchain-based e-commerce, which are related to each other in the focus of the criteria of publishing at least 1 work and receiving 1 citation from an institution. While represented by Natl dong Hwa University (2 studies), Air Force Engn University (1 study), Modul University of Vienna (1 study), the address institutions of the most cited works are Dalian University of Technol (156 citations and 0 total link strength), University Chinese Acad Sci (73 citations and 0 total link strength). In total, 4 clusters and 14 links were identified.

Figure 7. Network Connections of Institutions

Figure 8. Network Connectivity Density Map of Institutions



3.6. Co-Occurrence of All Keywords

Circles of the same color indicate that keywords are used together, circle sizes indicate the number of keywords used, and lines between circles indicate keywords that are related to each other. Accordingly, it has been determined that there are 26 clusters, 423 links and 468 total link strengths, of which 125 of the keywords used in international studies on blockchain-based e-commerce are related to each other. When the most frequently used keywords in the studies within the scope of blockchain-based e-commerce are examined, the concepts of blockchain with 30 repetitions and 124 connection strength, e-commerce with 19 repetitions and 67 connection strength, blockchain technology with 10 repetitions and 30 connection strength, cross-border e-commerce with 8 repetitions and 29 connection strength, smart contract with 5 repetitions and 22 total connection strength were determined primarily. In terms of total connection strength, the strongest expressions are blockchain, e commerce, blockchain technology.

Figure 9. Most Frequently Used Keyword Links

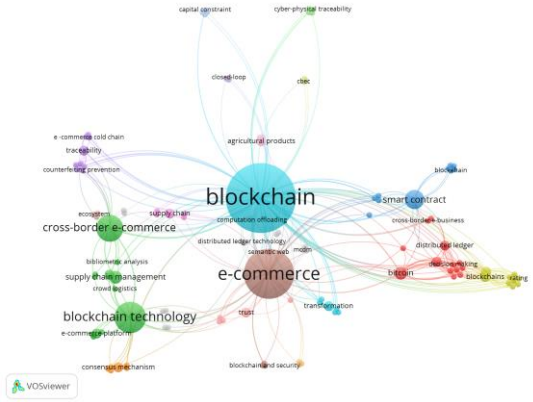
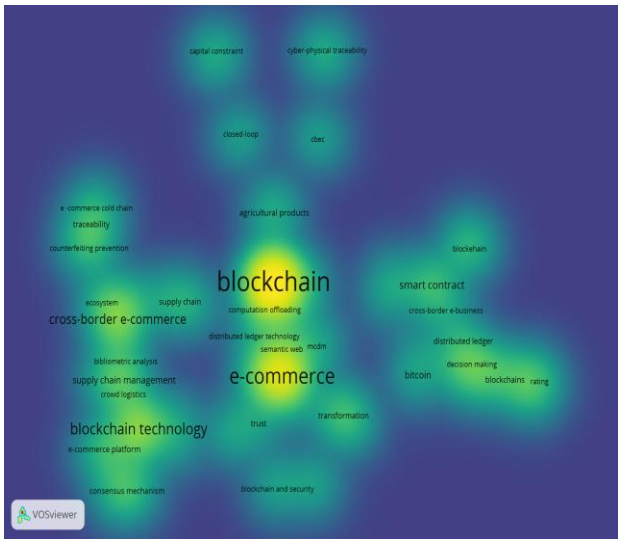


Figure 10. Most Frequently Used Keyword Links Density Map



3.7. Bibliographic Coupling of Documents

Bibliographic matching refers to the citation of a common work cited by two independent sources. According to the analysis conducted with 35 unit works selected with the criterion of having at least 1 citation and having a link between them, 7 clusters173 links and 292 total link strength were obtained. The publications with the highest number of bibliographic matches were Liu (2020) with 154 citations, Lahkani (2020) with 73 citations and Li (2020) with 65 citations. The works with the highest total link strength were Taherdoost (2023), Treiblmaier (2021) and Zhou (2022).

Figure 11. Bibliographic Match Links of the Works

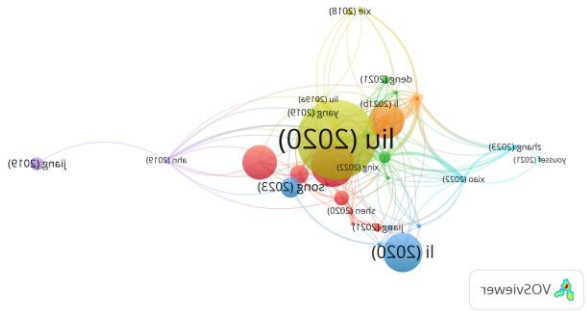
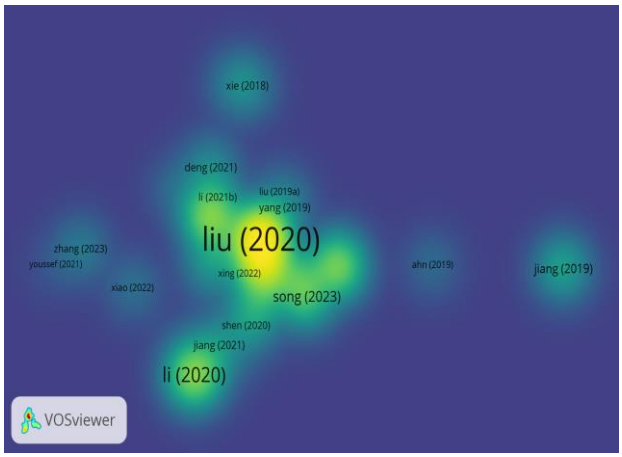


Figure 12. Density Map of Bibliographic Match Links of the Works



3.8. Bibliographic Coupling of Authors

As a result of the analysis conducted within the scope of 114 units, 14 clusters, 1803 links and 9932 total link strength were determined. The authors with the most bibliographic matches were Li Zipei and Liu Zhiyong with 156 citations each (290 link strength), Egorova Mariya and Urbanski Mariusz with 73 citations each (239 link strength).

Figure 13. Authors' Bibliographic Match Links

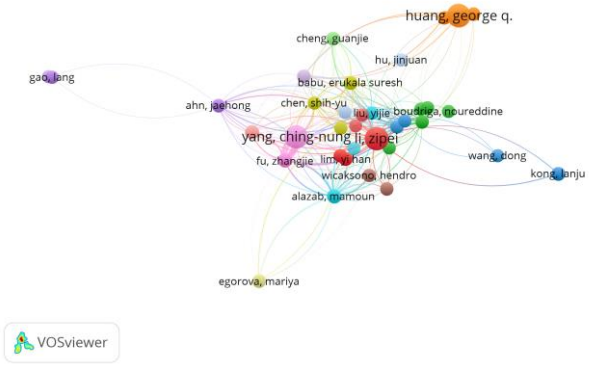
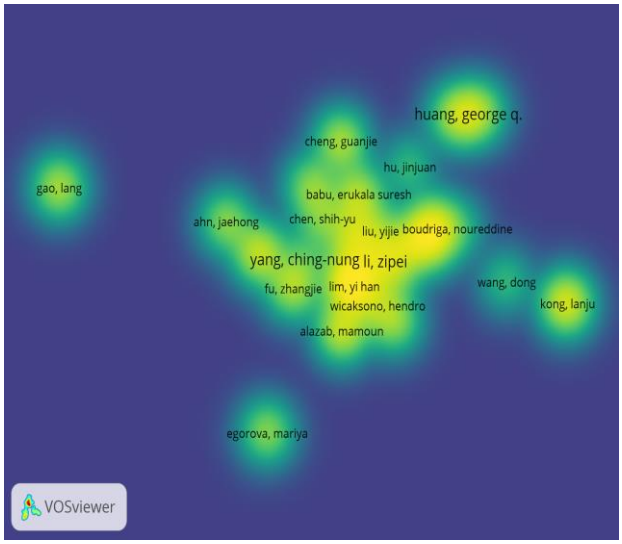


Figure 14. Density Map of Authors' Bibliographic Match Links



CONCLUSION

Bibliometric analysis is a type of analysis that allows statistical analysis of the topics in any field in the literature in terms of indicators such as year of publication, author information, research areas, types of publications, publication sources, institutions, countries of publication, keywords and languages of publication, and the display of the relationships between them through visual network maps. This analysis method has an important role in revealing very comprehensive statistical and visual data on a particular subject.

In the study, when the findings obtained from Web of Science, bibliometric analysis and visual network mapping through the "VOSviewer" program are evaluated together, 331 studies on the concept of blockchain-based e-commerce in the web of science between 2015-2024 were examined and data were obtained. Then, these studies were analyzed in terms of publication year, author information, research areas, publication sources, countries of publication and publication languages. In addition, visual network maps were created using the "VOSviewer" program and their relationships were determined. According to the research results, the number of articles published in the field of blockchain-based e-commerce over the years was the highest in 2022. It has been scattered until today. In the relevant study, concepts that accurately reflect the study were selected in the selection of keywords.

When the distribution and percentage distribution of studies on block chain-based e-commerce according to years are examined, when the relevant studies in the Web of Science database are examined, it is seen that the most studies were conducted in 2022. When the table is examined, the most studies were conducted in 2022 with 77 and 23.263%. 2022 is followed by 2021 with 68 publications and 20.544%, and 2023 with 61 publications and 18.429%. When the research areas of international studies on block chain-based e-commerce are examined, it is seen that the most studies were carried out in the field of Computer Science with a rate of 63.142% in 209 times. As a result of the examination of the studies according to the sources in which they were published, it was determined that the most published source in the international arena regarding block chain-based e-commerce was Ieee Access and Sustaınabılıty. When Web of Science was analysed, it was seen that the country with the highest number of studies on block chain based e-commerce was CHINA, the second country was USA and the third country was INDIA. When the publication languages of the studies on block chain-based e-commerce were examined, it was determined that the first place was prepared in English. The authors who conducted the most studies are not among the most connected ones.

This study is different from the studies in the literature in terms of scope and time period and includes the analysis of important international publications on blockchain-based electronic commerce available in the Web of Science. In Türkiye, there is no study similar to this issue yet. In this context, it can be recommended to contribute to the literature and be a source for future studies.

The place of electronic commerce is increasing in the face of rapidly increasing technological developments and changing consumer perceptions. However, this situation has caused some problems. These; The speed of payment in e-commerce, the reliability of data transfer and the transparency of information asymmetry, trust issues, protection of customer privacy and lack of legislation constitute some difficulties. Minimizing these problems by using decentralization, anti-fraud traceability, consensus mechanism, smart contract and other tools, which are the basic technologies of the blockchain, formed the basis of the study.

Our study has some limitations. The most important limitation of the study is that within the scope of the analysis, only examining the studies scanned in WOS (Web of Science) and excluding international databases such as Scopus and Pubmed and other sources that are not included in the scope of the analysis. Considering these limitations, which reveal the distinctive features of bibliometric analysis, it may be recommended to consider subjecting previously published studies to content analysis for similar research. In addition, it will be possible to find the most remarkable studies on this subject according to some basic indicators such as the number of articles, number of citations, and keywords.

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