e-ISSN: 2757 - 5489
TOPLUM, EKONOMİ VE YÖNETİM DERGİSİ
JOURNAL OF SOCIETY, ECONOMICS AND MANAGEMENT
Cilt Volume 4 Sayı Issue Özel Ay Month Ekim October Yıl Years 2023

A SYSTEMATIC REVIEW ON THE USE OF ARTIFICIAL INTELLIGENCE IN E-COMMERCE

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Abstract

Technological innovations in every field in recent years directly affect businesses and sectors. Artificial intelligence is one of the technologies that has attracted the most attention recently among these innovations. In this respect, it is a research topic that needs to be examined from a broad perspective and concerns many disciplines. Artificial intelligence has started a very fast and radical transformation process in the electronic commerce sector, as in many other sectors. It is seen that businesses in the e-commerce sector greatly benefit from artificial intelligence technologies to increase efficiency and productivity. Since artificial intelligence provides e-commerce companies with a high cost, efficiency and speed advantage, it is extremely important for e-commerce companies that want to be successful in the global competitive market to integrate artificial intelligence technologies into their processes. This article analyzes research trends for the use of artificial intelligence technology in e-commerce. The aim is to determine how this technology affects the e-commerce industry. Within the scope of the research, a systematic review, descriptive network analysis and bibliometric analysis methods were used within the scope of co-authorship, co-citation and keyword analysis. The result of the research reveals that the use of artificial intelligence technologies in e-commerce is an increasing trend in academic studies. The article is important in terms of the differentiation of theoretical and applied research in this field, keeping the topic up-to-date and guiding researchers who will work in this field.

Anahtar Kelimeler

Artificial Intelligence
E-Commerce
Bibliometrics Analysis
Technology

Makale Hakkında

Araştırma Makalesi

Gönderim Tarihi : 08.09.2023
Kabul Tarihi : 06.10.2023
E-Yayın Tarihi : 29.10.2023
DOI : 10.58702/teyd.1357551

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e-ISSN: 2757 - 5489

Cilt 4 Sayı Özel Ay Ekim Yıl 2023
Volume Issue Month October Years

TOPLUM, EKONOMİ VE YÖNETİM DERGİSİ
JOURNAL OF SOCIETY, ECONOMICS AND MANAGEMENT

E-TİCARETTE YAPAY ZEKA KULLANIMINA İLİŞKİN SİSTEMATİK BİR İNCELEME

Öz

Son yıllarda her alanda yaşanan teknolojik yenilikler işletmeleri ve sektörleri doğrudan etkilemektedir. Bu yenilikler arasında son dönemde en çok ilgi gören teknolojilerden biri de yapay zekadır. Bu yönüyle geniş perspektiften incelenmesi gereken ve birçok disiplini ilgilendiren bir araştırma konusudur. Yapay zeka birçok sektörde olduğu gibi elektronik ticaret sektöründe de çok hızlı ve radikal bir dönüşüm sürecini başlatmıştır. E-ticaret sektöründeki işletmelerin verimliliği ve üretkenliği artırmak için yapay zeka teknolojilerinden büyük ölçüde faydalandığı görülmektedir. Yapay zeka, e-ticaret şirketlerine önemli bir maliyet, verimlilik ve hız avantajı sağladığından, küresel rekabetçi pazarda başarılı olmak isteyen e-ticaret şirketlerinin yapay zeka teknolojilerini süreçlerine entegre etmeleri son derece önemlidir. Bu makale, e-ticarette yapay zeka teknolojisinin kullanımına yönelik araştırma eğilimlerini analiz etmektedir. Amaç bu teknolojinin e-ticaret sektörünü nasıl etkilediğini tespit etmektir. Araştırma kapsamında ortak yazarlık, ortak alıntı ve anahtar kelime analizi kapsamında sistematik tarama, betimsel ağ analizi ve bibliyometrik analiz yöntemleri kullanılmıştır. Araştırmanın sonucu, yapay zeka teknolojilerinin e-ticarette kullanımının akademik çalışmalarda giderek artan bir trend olduğunu ortaya koymaktadır. Makale bu alanda teorik ve uygulamalı araştırmaların farklılaştırılması, konunun güncel tutulması ve bu alanda çalışacak araştırmacılara yol göstermesi açısından önemlidir.

Keywords

Yapay Zeka
E-Ticaret
Bibliyometrik Analiz
Teknoloji

Article Info

Research Article

Received : 08.09.2023
Accepted : 06.10.2023
Online Published : 29.10.2023
DOI : 10.58702/teyd.1357551

Citation Information: Erdogan, U. (2023). A Systematic Review on the Use of Artificial Intelligence in E-Commerce. Journal of Society, Economics and Management, 4 (Special), 184-197.

Kaynakça Gösterimi: Erdoğan, U. (2023). E-Ticarette Yapay Zeka Kullanımına İlişkin Sistematik Bir İnceleme. Toplum, Ekonomi ve Yönetim Dergisi, 4 (Özel), 184-197.

e-ISSN: 2757 - 5489
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INTRODUCTION

Recent rapid developments in information technologies have deeply affected all sectors. The technological advances and innovations that have occurred are called the fourth industrial revolution after mechanization, automation and digitalization of factories (King, 2019: 16). With this concept that we encounter in various fields today, artificial intelligence and automation systems, which can communicate with each other, perceive each other, and realize the needs through data analysis, have begun to integrate into all processes and systems of enterprises. Artificial intelligence technologies that come with this concept are described as a revolution. Artificial intelligence technologies are rapidly changing traditional ways of doing business and market structures. Most start-up businesses and e-commerce firms compete to benefit from artificial intelligence technologies in their business investments (Lu et al., 2018: 372).

This article aims to systematically review academic articles on artificial intelligence technology in the e-commerce sector through the Web of Science (WoS) database. A bibliometric analysis is made by evaluating the spread of the academic literature in the field examined within the scope of the research. Much academic research has been done on artificial intelligence technology in recent years.

The global e-commerce market is constantly expanding, and more and more users are using online platforms. Thanks to technological advances, machine learning, big data and artificial intelligence have become more capable and more humanoid at solving problems, manipulating objects, moving and learning (Dwivedi et al., 2019: 5). E-commerce companies use artificial intelligence technologies for various purposes for the efficiency of their businesses (Vanneschi et al., 2018: 3). Data is one of the main components of artificial intelligence. Data is very valuable for a company in today's increasing customer diversity and information density.

This study aims to contribute to the academic literature by examining the latest approaches involving artificial intelligence technology applications in the e-commerce market, the applicability of these trends and their effects on internal and external stakeholders in the industry. The research aims to conduct systematic research on a subject such as artificial intelligence, about which many scientific publications have been produced. E-commerce has a lot of place in the world economy in terms of exports and economic growth. In addition, the e-commerce sector is a sector that is very open to the application of new technologies.

1. Literature Review

E-commerce offers consumers the convenience of shopping anytime, anywhere, without the need to go to physical stores. Compared to other areas, e-commerce brings higher profits with less capital requirement, making it one of the areas that many entrepreneurs are interested in and prefer. E-commerce, one area where artificial intelligence has created significant transformations, has started to take an important place in human life. Many people worldwide have started to use the internet regularly for products, entertainment places and to make friends (Chaffey and Chadwick, 2019: 5). Because of this, businesses' consumer behavior and marketing activities have completely changed. It would benefit companies operating in the electronic commerce sector to integrate artificial intelligence into their

marketing strategies to keep up with the competitive environment or gain an edge over their competitors (Pradeep et al., 2019: 25). Undoubtedly, artificial intelligence and e-commerce are used side by side much more now since artificial intelligence technology has an important place in increasing the efficiency of e-commerce. In fact, it is accepted in the literature that the technological development of e-commerce is parallel to the advancement of artificial intelligence technologies (Song et al., 2019: 3).

In one study, the authors explore the role of artificial intelligence in driving e-commerce activities, with a particular focus on customer behavior. The study proposes a model based on risk theory and the CRCB framework to help managers and policymakers develop new policies to serve customers better. The article also highlights Alibaba and Tencent's dominance of the Chinese e-commerce market and their investments in artificial intelligence (Rashidin et al., 2022: 2).

Integrating artificial intelligence (AI) into businesses is a challenge despite the growing interest. According to recent surveys, 85% of AI startups fail to meet their goals, demonstrating the challenge of implementing AI in businesses. Artificial intelligence capabilities are not independent and interact and evolve together with human capabilities to create business value in terms of space optimization and workforce efficiency and efficiency such as error reduction. Business managers must ensure that they take advantage of available resources and capabilities, for example, by unleashing the learning power of artificial intelligence through the creativity of human workers (Zhang et al., 2021: 10).

In another paper, it was concluded that the e-commerce system can be optimized using artificial intelligence and blockchain technology to maximize efficiency and objectivity. The article proposes an optimized online website innovation plan based on AI analysis. The simulation test confirms the effectiveness of the structure optimization of the e-commerce platform performed in this paper. The article also recommends further efforts to deal with the theoretical analysis system of the design and establish the evaluation standard, as well as statistical calculation of resource allocation vulnerabilities of online websites (Li, 2020: 7).

In a study, the most efficient recommendation strategies for artificial intelligence-supported e-commerce sites were investigated in the case of binary manufacturers and industry competition. The authors develop a game model to determine the impact of competition intensity and commission rate on manufacturers' ideal pricing decisions and the platform's recommendation strategies (Zhou, 2023: 1087).

2. Materials and Methods

Bibliometric analysis is defined as a method in which mathematical and statistical techniques are used in examining scientific information-sharing tools such as published journals and books. (Diodato, 1994: 12-15). As a result of the analysis of the data obtained by bibliometric methods, it is possible to reveal insights about the structure of the research area, social networks and current interests. The purpose of bibliometrics is summarized as evaluating the accumulated output of studies published by scientists, and attention is drawn to the usefulness of bibliometric methods in terms of examining science as a knowledge generation system (Barrios et al., 2008: 455). Bibliometry has been used to reveal the most cited authors in many academic studies and the most cited scientific research articles or country-

based contributions. This research method can determine the current publication status of a subject in a particular field by establishing a broad research perspective.

The study, using the bibliometric analysis method, aims to present a systematic literature review and inferences about the field of artificial intelligence in the field of e-commerce. In this direction, the bibliographic data obtained from the Web of Science (WoS) database, which is preferred due to its ease of access, with over 171 million records and approximately 1.9 billion cited references, and the development of the research subject in the historical process, its intellectual structure and author-publication. By determining the index-institution-country relations, a general framework has been tried to be put forward by examining them in the context of the relationship between e-commerce and artificial intelligence. The data in the research were obtained from the WoS database, which is frequently used in academic research, and since it is aimed to access the studies that include the concepts of 'e-commerce' and 'artificial intelligence' in the title, abstract and author keywords, the index was searched through the 'topic' option. The query words were determined as 'e-commerce' OR 'electronic commerce' OR 'online shopping' OR 'internet shopping' OR 'ecommerce' OR 'online store' AND 'artificial intelligence' OR 'artificial Intelligence' OR 'artificial neural network'. As a result of the search, 526 articles were listed in the WoS directory. The VOSviewer package program, an open-source tool developed by Nees Jan van Eck and Ludo Waltman (2010), was used to perform the analyses due to its user-friendly interface and its superior capabilities in visualizing the analysis results.

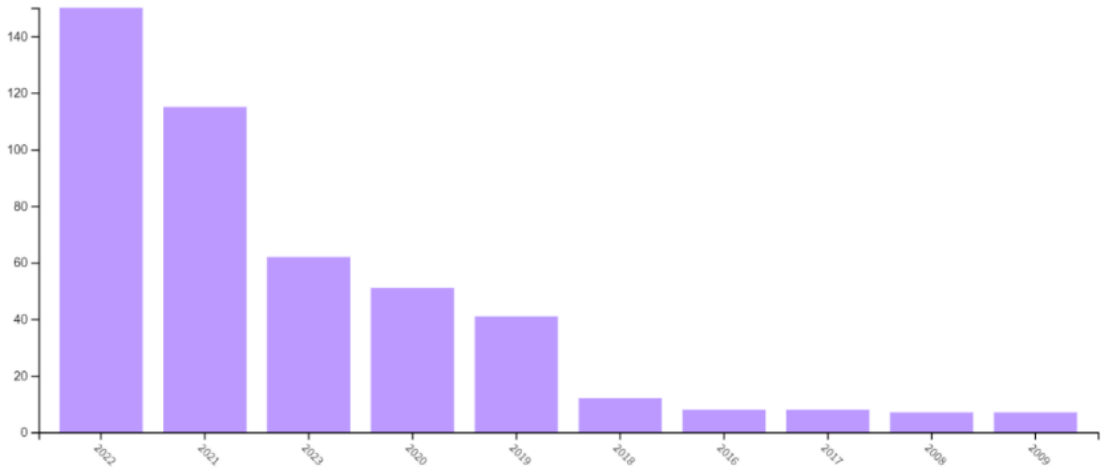
3. Results

In this part of the study, the results of the analysis of the data obtained from the WoS database on e-commerce and artificial intelligence and the network maps created using the VOSviewer program are included.

3.1. Production Trends

When we look at the articles in which e-commerce and artificial intelligence are studied together, there has been an increase every year since 1998, when the first study was conducted, as seen in Figure 1. This increase has been faster, especially since 2019. While there were 12 articles in 2018, 41 articles were published in 2019, 51 articles were published in 2020, 115 articles were published in 2021, and 150 articles were published in 2022. Until August 2023, 62 articles were published.

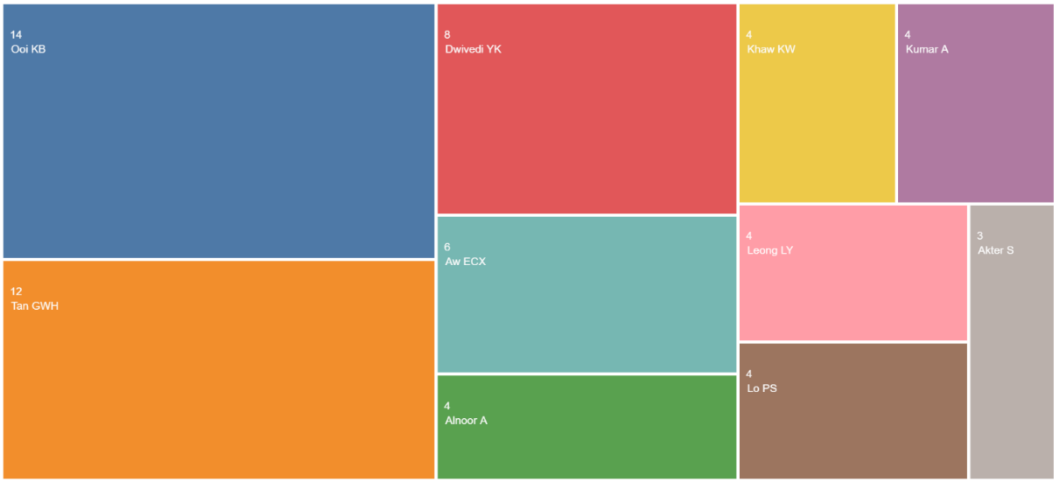
Figure 1. Annual Scientific Production



3.2. Authors' Publications

Out of 526 studies in the field of e-commerce and artificial intelligence, 14 were Ooi, K.B., 12 were Tan, G.W.H., 8 were Dwivedi, Y.K., 6 were Aw, E.C.X. Published by Alnoor, A., Khaw, K.W., Kumar, A., Leong L.Y. and Lo, P.S. contributed to the field with 4 studies each.

Figure 2. Authors' Publications



3.3. Publication Titles

Looking at the journals in which the articles are published, Sustainability ranks first with 20 articles. 15 articles were published in Expert Systems with Applications, 10 articles were published in Mobile Information Systems, 9 articles were published in Electronic Commerce Research and Applications and Electronics, 8 articles were published in Computational Intelligence and Neuroscience, International Journal of Advanced Computer Science and Applications, and Journal of Retailing and Consumer Services. 7 articles have been published in Computers in Human Behavior, Ieee Access, International Journal of Computer

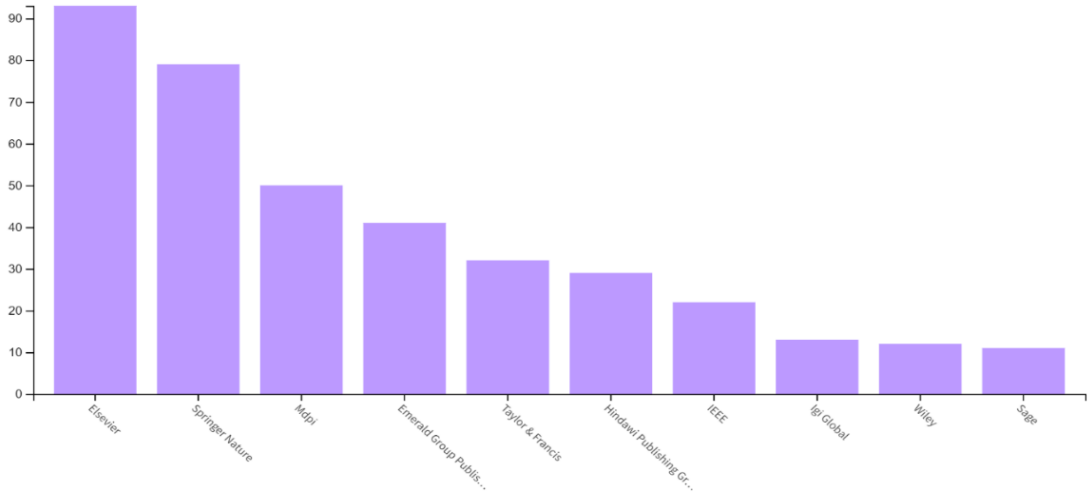
Science and Network Security and Journal of Theoretical and Applied Electronic Commerce Research. These journals appear to be the most widely published journals in the field of e-commerce and artificial intelligence.

Table 1. Publication Titles

Publication Titles	Record Count	% of 526
Sustainability	20	3.802%
Expert Systems with Applications	15	2.852%
Mobile Information Systems	10	1.901%
Electronic Commerce Research and Applications	9	1.711%
Electronics	9	1.711%
Computational Intelligence and Neuroscience	8	1.521%
International Journal of Advanced Computer Science and Applications	8	1.521%
Journal of Retailing and Consumer Services	8	1.521%
Computers in Human Behavior	7	1.331%
Ieee Access	7	1.331%
International Journal of Computer Science and Network Security	7	1.331%
Journal of Theoretical and Applied Electronic Commerce Research	7	1.331%
Frontiers in Psychology	6	1.141%
Journal of Electronic Commerce Research	6	1.141%
Journal of Global Information Management	6	1.141%
Lecture Notes in Computer Science	6	1.141%
Wireless Communications Mobile Computing	6	1.141%

In the query made in the context of publishers, it was determined that 83 publishers were listed. Between 1998-2023 (August), 93 publications were published by Elsevier, 79 publications by Springer Nature, 50 publications by Mdpi, 41 publications by Emerald Group Publishing, 32 by Taylor and Francis, 29 by Hindawi Publishing Group, and 22 by IEEE. It was determined that 520 of 526 articles were written in English and 6 of them were written in different languages. In the analysis made on the basis of the indexes in which the journals were scanned, it was found that 53% (n=277) of these studies were included in the Science Citation Index Expanded (SCI EXPANDED), 40% (n=209) were scanned in the Social Sciences Citation Index (SSCI), and 20% (n=106) appear to have been scanned in the Emerging Sources Citation Index (ESCI).

Figure 3. Publishers



3.4. Research Areas

When the research areas of the articles (at least 10 publications) are examined, it is seen that most studies were done in the field of Computer Science with 243 publications. This number corresponds to approximately 46% of all publications. It is followed by Business Economics with 138 publications, Engineering with 105 publications, and Telecommunications with 38 publications.

Table 2. Research Areas

Research Areas	Record Count	% of 526
Computer Science	243	46.198%
Business Economics	138	26.236%
Engineering	105	19.962%
Telecommunications	38	7.224%
Operations Research Management Science	32	6.084%
Information Science Library Science	28	5.323%
Science Technology Other Topics	26	4.943%
Environmental Sciences Ecology	21	3.992%
Psychology	21	3.992%
Social Sciences Other Topics	15	2.852%
Mathematics	12	2.281%
Physics	12	2.281%
Neurosciences Neurology	10	1.901%

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3.5. Nationalities of The Authors

Table 3 shows the 15 most repeated nationalities among the authors of the analyzed articles, as the same article may belong to researchers from different countries. China is the country with the most publications, with 152 publications. This country is followed by India, USA, Malaysia, UK and other countries.

Table 3. Nationalities of The Authors

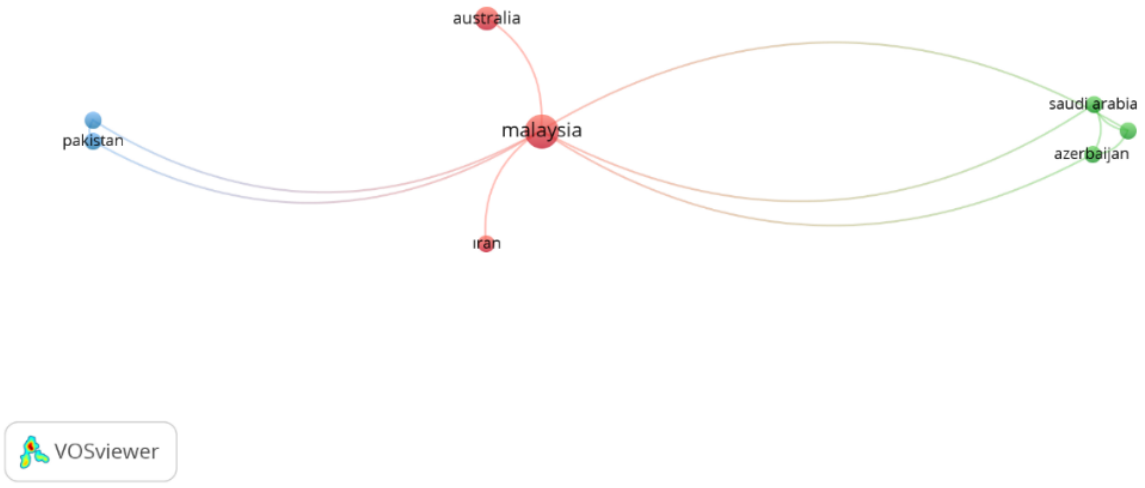
Country	Record Count	% of 526
China	152	28.897%
India	79	15.019%
USA	71	13.498%
Malaysia	39	7.414%
England	32	6.084%
Taiwan	31	5.894%
South Korea	29	5.513%
Australia	21	3.992%
Germany	21	3.992%
Saudi Arabia	16	3.042%
Spain	15	2.852%
Pakistan	15	2.852%
Neurosciences Neurology	10	1.901%

3.6. Network Analysis

3.6.1. Co-Authorship of Countries

Figure 4 presents a visualization map of the co-authorship of countries in the literature on artificial intelligence and its use in e-commerce processes. The size of the node represents the number of articles published by different countries. The growth in size indicates that countries are broadcasting more. Looking at the dimensions shown in Figure 4, Malaysia appears to be the most influential country in terms of articles on artificial intelligence technology and e-commerce.

Figure 4. Network Analysis of Countries' Co-Authorship



3.6.2. Keywords Co-Occurrence

A total of 18 cluster densities with 477 connections among the 116 key aggregation overalls were analyzed. Among the 116 keywords analyzed, the words 'e-commerce', 'artificial intelligence', 'electronic commerce', 'cross-border e-commerce', 'big data' and 'artificial neural network' were determined as the most frequently used words in the researches in the field of e-commerce and artificial intelligence.

Figure 5. Network Analysis of Keywords

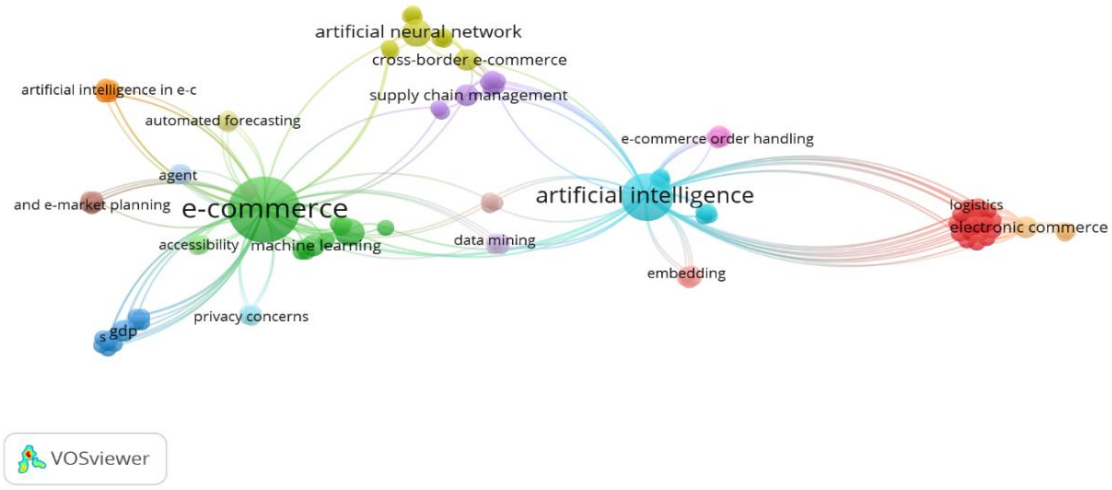


Table 4 represents the top 10 keywords represented by the strength of each link. Logically, 'e-commerce' is the keyword with the most effective power in total relations with 17.

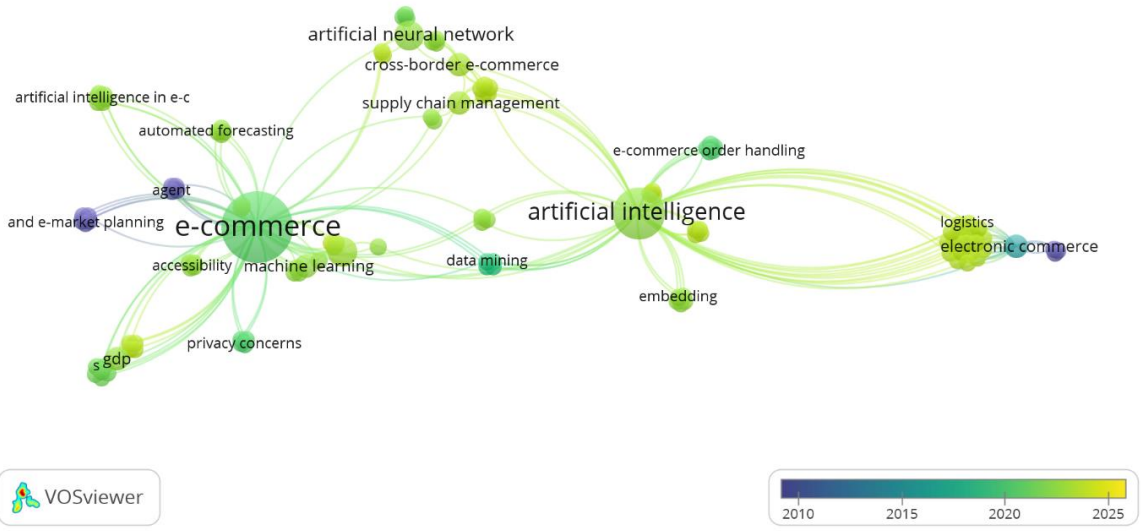
Table 4. Co-Occurrence of Keywords

Keywords	Occurrences	Total Link Strength
E-Commerce	17	70
Artificial Intelligence	9	55
Artificial Neural Network	3	10
Big Data	3	10
Electronic Commerce	2	22
GDP	2	12
Cross-Border E-Commerce	2	11
Supply Chain Management	2	10
E-Commerce Platform	2	8
Machine Learning	2	7
Artificial Intelligence	9	55
Artificial Neural Network	3	10

The temporal trend network map with 116 keywords is given in Figure 6. This network map shows which keywords were more heavily researched for their association at different time periods between 2010 and 2020. Accordingly, it is seen that the clusters shown in yellow,

which include keywords such as artificial intelligence, cross-border e-commerce, digital transformation, data and logistics, correspond to the topics examined in recent years.

Figure 6. Common Word Analysis – Temporal Trend Network Map



3.6.3. Autor Co-citation

Analysis of authors' joint citations was made by considering at least 3 citations per author. Sixty-four authors were filtered by this selection. Table 5 presents a list of the 10 most cited authors jointly by other researchers. Accordingly, the authors with the highest co-citation power are seen as Liu Y., and Shen B. Dinev T, Kim DJ, and Xu H are the authors with the highest connectivity.

Table 5. Autor Co-Citation

Author	Citations	Total Link Strength
Liu,Y	8	43
Shen, B	8	16
Nielsen, J	7	14
Dinev, T	6	180
Li, H	5	124
Gefen, D	5	109
Chong, AYL	5	86
Hair, JF	5	51
Ngai, EWT	5	35
Ho, GTS	5	15
Liu,Y	8	43
Shen, B	8	16
Nielsen, J	7	14

CONCLUSION

Artificial intelligence technology applied in the e-commerce sector is an exciting and new field of research in terms of improving the value chain of shopping services and increasing the efficiency and profitability of the sector in general. This article provides an overview of the research field using descriptive bibliometric analysis, network analysis, and visualization based on co-authorship and co-citation criteria.

Artificial intelligence systems, which benefit from many different technologies, from machine learning to data science, from deep learning to voice assistant, increase the e-commerce experience; chatbots, search engines and personalized customer service applications improve the structure of e-commerce. Businesses that make most of their sales on e-commerce platforms allocate a significant part of their digital marketing budgets to artificial intelligence-based applications. Among the most important benefits of artificial intelligence are increasing efficiency, saving time, better understanding of customer information, making marketing decisions more applicable, increasing the return on investment and providing customer satisfaction (Shahid and Li, 2019: 32).

The COVID-19 pandemic has had major effects on various aspects of social life, including the economy. The decrease in the purchasing power of individuals who cannot do business has led to an increase in electronic commerce as a product and service supply tool. Businesses operating in the field of e-commerce should consider factors such as increasing internet speed, expanding 5G and Wi-Fi networks, and increasing accessibility and trust in mobile devices and applications to increase the growth and competitiveness of e-commerce (Vărzaru and Bocean, 2021: 2315).

The development of network computing technology and artificial intelligence technology has led to the creation of software agents. E-commerce, especially in C2C transactions, has inherent information asymmetry due to the anonymity and liquidity of transactions. In the virtual environment, buyers cannot physically see the products and can only rely on the seller's photos and descriptions to select the products. A new C2C e-commerce credit system model based on the game theory model of e-commerce buyers and AI technology sellers is proposed to promote the development of e-commerce (Mu and Ding, 2022: 9).

It is necessary to develop a corporate social responsibility model based on humane principles in e-commerce and high technology in the artificial intelligence economy. The high technology of the artificial intelligence economy makes it possible to maximize the contribution of responsible human resource management (HRM) in e-commerce businesses to increase their revenue (Zavyalova et al., 2023: 8).

E-commerce companies can use Chatbots to enhance their customers' online shopping experience by providing authentic conversations and convenience. Companies can also focus on developing Chatbot technology to address users' concerns about privacy and technology immaturity. Both utilitarian and hedonic factors need to be considered in the design and implementation of Chatbots in e-commerce (Marjerison et al., 2022: 1).

Businesses and large e-commerce firms actively apply artificial intelligence technology and optimize their e-commerce platforms to increase their competitiveness. With the support of artificial intelligence technology, e-commerce will have a wider development trend, and this will further improve customer relations and experiences with alternative applications. Quick answers to instant questions should be provided 24 hours a day, 7 days a week via chatbots. Likewise, instant interactions with WhatsApp and social media applications and their questions should be answered quickly. The customer's contact point is not *call center* numbers but web and mobile applications.

While the traditional form of stock management is limited to current stock levels, AI-assisted stock management should provide how to maintain stocks with the sales trend in previous years, anticipated or expected changes in product demands, and potential supply-related issues that will affect stock levels. In addition to inventory management, warehouse management is also provided with the emergence of automated robots, which are predicted as the future of artificial intelligence in e-commerce.

Artificial intelligence is a transformative force, especially in the e-commerce sector, and this is inevitable. It is certain that this development will continue to increase due to the developing technologies day by day. In this age where digitalization is effective in every field, if artificial intelligence is not used in e-commerce activities, falling behind competitors is an inevitable result. For this reason, it is very important for e-commerce companies to follow the developing technology and integrate artificial intelligence into their systems.

This article presents a bibliometric analysis and literature review of research on artificial intelligence in e-commerce. The main research themes in this research area are optimization in e-commerce, trust and personalization, sentiment analysis and artificial intelligence-related technologies. The article will contribute to the researchers who will work in this field in the future by analyzing the results of studies in this field. The limitation of this study is that only the Web of Science database was used for its preparation. Therefore, the analysis can be extended for future research by including Scopus or other alternative databases.

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