

Bibliometric Analysis of Artificial Intelligence in the Scope of E-Commerce: Trends and Progress over the Last Decade

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DOI: 10.24818/mer/2024.01-01

ABSTRACT

Artificial intelligence (AI) techniques are commonly used in e-commerce, but there is little bibliometric analysis in this field. Using a bibliometric approach, it conducted a comprehensive study over the past decade to assess the research landscape, progress, and emerging trends in the field of artificial intelligence in e-commerce. Data was collected from related literature in the Scopus database from 2014 to the first half of 2023. VOSviewer and R studio were used to perform the bibliometric analysis of AI in e-commerce. The author status, nations, affiliations, annual publications, keywords, and journals were all evaluated in this way. The oldest relevant article was published in 1994, and article reviews were the most common form of document among the 669 manuscripts. Furthermore, the most popular research areas in this topic are business, management, and accounting. Additionally, the most productive journal is Proceedings of the International Conference on Electronic Business (ICEB). Moreover, the UK is the country that has published the most articles, and in terms of co-authorship, it has the strongest overall link. Finally, the keyword co-occurrence network indicates that the most important keywords are machine learning, e-commerce, recommender systems, fraud detection, decision-making systems, data mining, and online retailing.

KEYWORDS: *artificial intelligence, bibliometric analysis, e-commerce, emerging trends, co-authorship patterns.*

JEL CLASSIFICATION: *C19, L81.*

1. INTRODUCTION

It is difficult to define "e-commerce" in all contexts. Electronic commerce, or just e-commerce, is defined, for instance, by Salvador M. (2013) as a business transaction in which products, services, or information are exchanged using electronic equipment. Albertin (1999), who has a more comprehensive viewpoint, claims that e-commerce is the realization of the complete value chain of commercial activities in an electronic context through the extensive application of communication and information technology to meet business goals. Vasco Santos (2022) defines e-commerce as an activity focusing on business transactions between individuals and organisations, including the buying and selling of items with integrated technology. E-commerce largely benefits online businesses by expanding the number of customers served, the volume of orders, and the calibre of information offered.

The most current of these technologies is artificial intelligence (AI), which allows for the development of new ideas and models for e-commerce (Tapan Kumar, 2019). To solve the expanding challenges of e-commerce, artificial intelligence simulates and extends human intelligence (Neha Soni, 2019). Soni (2020) illustrated, for example, how AI assists e-

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commerce companies in managing and tracking their clients. A company may use AI to collect and analyse data in order to ensure that its consumers receive high-quality services. This allows e-commerce platforms to better understand the factors driving the purchasing decisions of its present and potential customers. It promotes contact between e-commerce enterprises and their customers by using chatbots and messengers.

Research into AI in e-commerce has been ongoing for the past few decades. 3279 scientific papers have been published on the subject in multiple disciplines in the Scopus database. A bibliometric study is therefore required due to the expanding research trends in artificial intelligence in e-commerce. This study is a bibliometric analysis of the literature on artificial intelligence in research trends and patterns in internet commerce. A group of quantitative techniques known as "bibliometrics" are used to examine a study area using the article metadata that is provided by bibliographic databases such as Scopus and the Web of Science Core Collection (Gutiérrez-Salcedo, 2018). This metadata provides the title, keywords, abstract, and citation information for a piece of writing. Performance analysis and scientific mapping are two of the primary bibliometric techniques used for the investigation of research fields. By identifying important contributors (authors, nations, organisations), finding trustworthy sources of academic publication, and quantifying academic output, performance analysis offers a means to evaluate it for productivity, quality, and scientific impact (Garcia-Buendia et al., 2021).

Bibliometrics has been successfully used in the field of AI in E-commerce. Bawack et al. (2021) presented a bibliometric study and a literature review, discussing artificial intelligence in electronic commerce. Bibliometric data from 4335 documents in the Web of Science database were analysed with the help of R-Bibliometrix, however, no study has dealt with the extant literature on AI in E-commerce on the Scopus database. Hence this article attempts to fill this gap by carrying out a bibliometric analysis of 669 documents published between 2014 and 2023 on the Scopus database; this study was performed with the help of two software programs, R Bibliometrix and VOSviewer. Runyue Han's (2021) study focuses on the issues and roles of AI in B2B marketing innovation. It examines 221 journal articles between 1990 and 2021 using a bibliometric method. It identifies key authors and articles that are widely cited, and divides the application of AI in B2B marketing innovation into five areas, providing an overview of current trends and identifying future research directions. Felipe Escobar Ruiz (2021) undertook a bibliometric analysis of 226 articles in the Scopus database between 2000 and 2020. The study assesses the progress of e-commerce research, focusing on the diffusion, adoption, and acceptability of the technology. Despite the developments, the analysis shows that various challenges and approaches continue to be studied in different countries, reflecting the dynamic nature of the field. Varsha P. S. (2021) conducted a comprehensive bibliometric analysis of the impact of AI on branding, encompassing 117 publications published between 1982 and 2019. The study identifies nine co-occurrence groups, including social media analysis, neural networks, and chatbots, highlighting the multidimensional impact of AI on branding. Analysis of citations and co-occurrence groups sheds further light on converging and diverging themes, adding to recent advances in AI and branding.

The objective of this study is to conduct a quantitative and thorough investigation into the area of artificial intelligence in electronic commerce by doing the following tasks:

- Finding patterns in yearly publications and articles.
- Examine the literature's geographic distribution.
- List eminent writers and prestigious publications in the field of research.
- Recognise trends, subject advancements, and hotspots in research.

2. MATERIALS AND METHODS

This study is a contribution to the existing literature on artificial intelligence applications in e-commerce. It explores the relationship between artificial intelligence and e-commerce. The data from the bibliometric study are included in the set of research results on artificial intelligence and e-commerce appearing simultaneously in the Scopus database. The bibliometric analysis is frequently used to assess the quality of research studies and to identify the models and characteristics of a specific topic (Alhamzah et al., 2022; Alhamzah et al., 2020; Srivastava, 2020.). Bibliometric indicators assess the breadth and quality of underlying research studies by counting publications and citations (Bahuguna et al., 2022; Roy et al., 2022).

The renowned Scopus database was used as the basis for data collection in this study. Elsevier founded the Scopus database in 2004. It serves as a multidisciplinary repository for reports. It is one of the largest "peer-reviewed" databases in the world, containing over 24,000 active academic journal titles on a variety of topics of high research interest, including life sciences, health sciences and social sciences (Amodio, 2021; Niknejad et al., 2021). Scopus has the fewest "inconsistencies" in terms of content verification and quality compared with other academic research databases (such as Google Scholar or Web of Science). Precise information is available in Google Scholar and Web of Science; however, these databases contain double copies of some citations, and even triple copies in some cases. As a result, the same information may appear in a large number of reports, leading to erroneous statistics. In addition, Scopus gives users access to online bibliometric analysis tools for their publications, such as h-index calculations and statistical analysis tools such as graphs showing the frequency of publications over time, and so on (Ragazou et al., 2023).

2.1 Sampling and Data Collection Process

In order to identify more precisely the relevant scientific articles to the subject of the study, we limited the search to studies that could be found by title, abstract, and keywords; the reference period was set between 2014 and 2023. Data were collected in July 2023. As a result, there were 669 papers downloaded in mass (see Figure 1).

2.2 Measuring Tools and Materials

The authors codified and encoded the procedures utilised with software (Rstudio and VOSviewer); these bibliometric analysis methodologies are divided into two groups. The first category is performance analysis, which examines research components' contributions to a certain field; it is usual practice in reviews to display the performance of numerous research components.

The most frequently used indicators are citations per year or by research element, and the number of publications, with publication serving as an indicator of productivity and citation serving as a measure of effect and influence. The second point concerns scientific mapping, which examines the relationships between research elements. Scientific mapping techniques include citation analysis, co-author analysis, co-citation analysis, co-word analysis, and bibliographic linkage. Network analysis, combined with the above techniques, is another tool for displaying the bibliometric and intellectual structure of the research field.

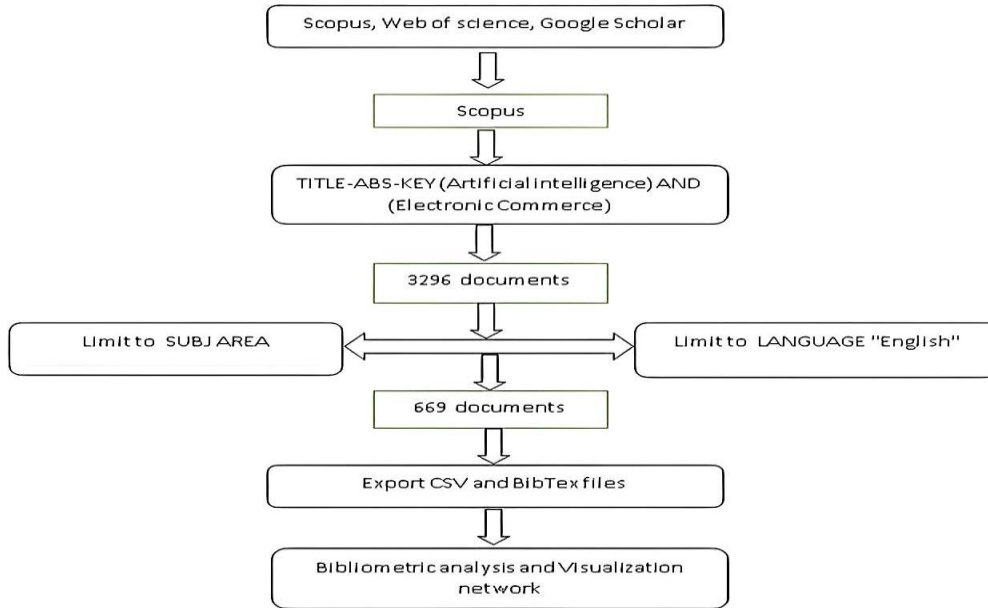


Figure 1. Staging Data Selection
Source: Drew by the authors

3. DESCRIPTIVE ANALYSIS OF THE LITERATURE

3.1 Principal Information about Data

The primary data information is displayed in Table 1. 669 manuscripts were published between 2014 and July 2023 in 329 different Sources; 1909 authors published these manuscripts, with 74 single authors; in addition, they used 30479 References; and they received 13.1 citations per document.

Table 1. Descriptive Statistics

Project description	Results
Timespan	2014:2023
Sources (Journals, books, etc.)	329
Documents	669
Annual growth rate (%)	19.22
Documents Average age	2.76
Average citations per docs	13.1
References	30479
Keywords plus (ID)	3119
Author keywords (DE)	2142
Authors	1909
Authors of single-authored docs	74
Single-authored docs	74
Co-authors per doc	3.24
International co-authorships %	24.36
articles	407
Conference paper	262

Source: constructed by authors based on R Studio using Biblioshiny

3.2 Number of articles published and trends

The total number of publications is typically regarded as an essential indicator, a gauge of the evolution of this field, and the easiest way to assess the quality of scientific archives (Yuan, 2022) (Chen & Guan, 2011). As a result, in order to establish a foundation for future study on AI in e-commerce, annual distribution data for the literature gathered are first compiled (Figure 2).

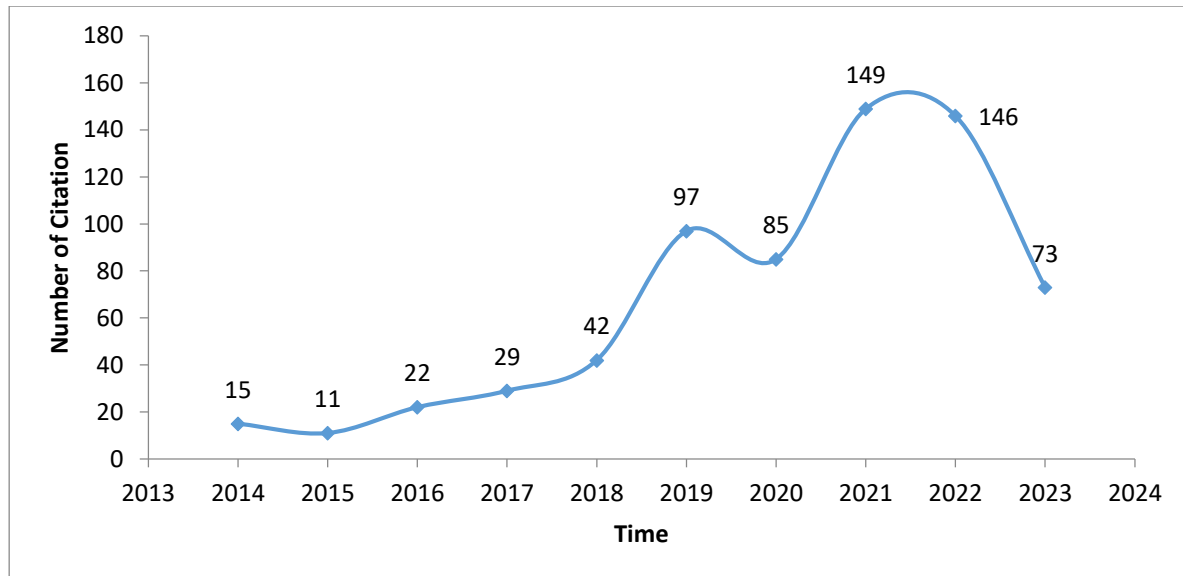


Figure 2. Literature Distribution in the Timeline

Source: elaborated by authors using Excel tables based on data extracted from Scopus

To demonstrate that researchers are still interested in publishing on this topic, the first half of 2023 has been included. Between 2014 and 2022, the number of publications is generally on the rise, and between 2018 and 2022, publications are expected to increase by around 256.10%. We anticipate that 666 publications could exist by the end of 2023.

Four stages can be distinguished in the research on artificial intelligence in e-commerce (see Figure 2): Stage I ranges between 2014 to 2016, the number of publications was relatively low; there were 11 to 22 publications per year. This may indicate that around this time, AI and machine learning were still novel ideas in the context of digital marketing and e-commerce. Stage II extends between the year 2017 and 2018, with 29 and 41 publications, respectively. There was a moderate increase in the number of publications throughout this phase. This shows a rise in curiosity about the use of AI and machine learning in e-commerce and digital marketing. It is possible that researchers and professionals were beginning to realise how these technologies could influence marketing and e-commerce efforts. Stage III is from 2019 and 2020, with 97 articles in 2019 and 85 publications in 2020. There was a notable increase in publications throughout this phase. This shows that research on and interest in the convergence of artificial intelligence, machine learning, digital marketing, and e-commerce have significantly increased. It shows that these subjects were gaining popularity and that researchers were actively looking into the advantages and difficulties of putting them into practice. Stage IV is from 2021 to current day, with 149 publications in 2021, 146 publications in 2022, and 67 in the first-half of 2023, there was a persistent upward trend in the number of publications during this phase. This suggests a persistent and expanding interest in the subject.

The increase in the number of publications in recent years shows that artificial intelligence and machine learning are becoming increasingly popular tools for improving digital marketing and e-commerce procedures. In order to improve the customer experience, optimise marketing initiatives and increase sales in the digital sphere, researchers are probably investigating cutting-edge algorithms, data analysis approaches and AI-based strategies.

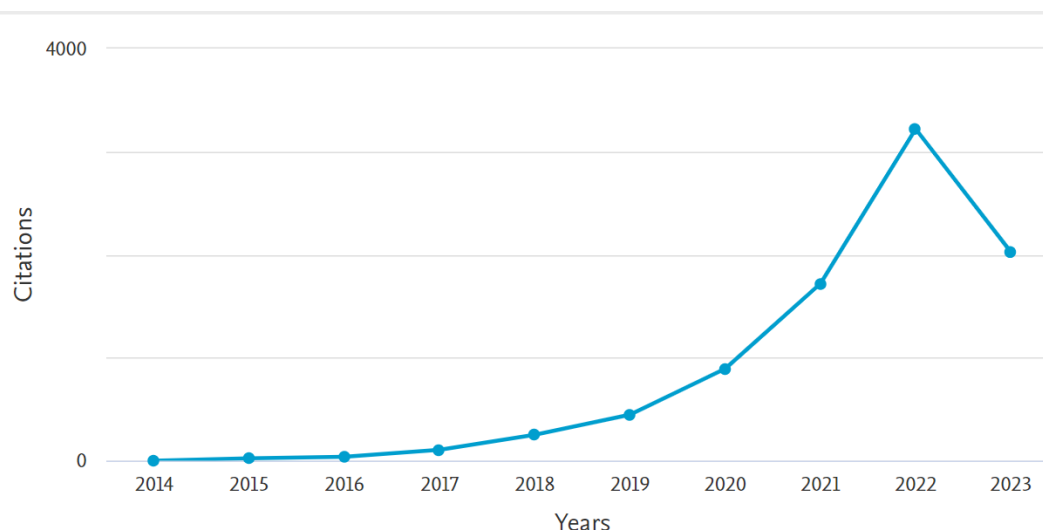


Figure 3. Annual Number of Citations
 Source: retrieved from Scopus Results analysis

As Figure 3 demonstrates, since 2014, the number of articles cited in the field of artificial intelligence research in e-commerce has increased rapidly each year, particularly after 2018. The literature relating to artificial intelligence research in e-commerce was cited only 167 times in the period 2014-2017, including just once in 2014. Of all the literature samples, the most cited was an article by (Xiang, 2017), which was co-cited 478 times. Xiang (2017) describes social media analysis in hospitality and tourism. In addition to Xiang and Zheng (2017), the most-cited articles and their overviews are presented in Table 2. The disciplines involved in research on artificial intelligence in e-commerce are mainly business, management and accounting (24.0%), computer science (21.8%), social sciences (13, 6%), decision sciences (12.8%), engineering (9.1%), economics, econometrics, and finance (4.6%), mathematics (3.7%), energy (2.6%), arts and humanities (2.1%), and psychology (1.9%). AI in e-commerce is an inter-disciplinary field that has become a research issue of interest in several disciplines, including the arts and humanities and psychology (see Figure 4).

Table 2. Highly cited articles in literature samples

Document	Citation	Review	Overview
(Xiang, 2017)	469	TOURISM MANAGEMENT	This paper explores the major online review platforms in the context of hospitality and tourism, and discusses the implications of social media analytics in this industry.
(Dwivedi, 2021)	448	INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT	This document presents an overview of the current state of digital marketing and social media research, and outlines future directions and research proposals in this field.
(Singh, 2017)	266	JOURNAL OF BUSINESS RESEARCH	The "usefulness" of Internet user reviews is the main topic of this essay. The authors want to create a model that can accurately assess the usefulness of user-generated reviews across different websites.

Document	Citation	Review	Overview
(Arora, 2019)	236	JOURNAL OF RETAILING AND CONSUMER SERVICES	This paper explores the concept of social media influencer index and provides insights based on data from Facebook, Twitter, and Instagram. The authors aim to measure the influence of social media influencers across these platforms and offer valuable insights into the effectiveness of influencer marketing
(Ferreira, 2016)	225	MANUFACTURING AND SERVICE OPERATIONS MANAGEMENT	The application of analytics to an online retail business is the main topic of this article. The authors specifically discuss two key areas: demand forecasting and price optimisation.
(Sima, 2020)	204	SUSTAINABILITY (SWITZERLAN)	This article offers an in-depth analysis of how the Industry 4.0 revolution has affected both consumer and human capital development. The authors aim to gather and synthesise existing research in order to gain insights into how the fourth industrial revolution is transforming these two key areas.
(Adam, 2021)	183	ELECTRONIC MARKETS	This paper explores the use of AI-based chatbots in customer service and investigates their effects on user compliance. The authors aim to understand how the introduction of AI chatbots impacts user behaviour and compliance with the instructions provided by these chatbots.
(Steinhoff, 2019)	169	ACADEMY OF MARKETING SCIENCE	This paper focuses on the concept of online relationship marketing and its significance in the context of digital business environments. The authors aim to provide insights into the strategies and practices employed by organizations to cultivate and maintain relationships with customers online.
(Carneiro, 2017)	160	DECISION SUPPORT SYSTEMS	The main objective of this research is the creation of a data mining system for the detection of credit card fraud in e-retail sales contexts. The authors seek to address the problem of fraudulent activity in online transactions and propose a solution that uses data mining techniques to identify and prevent credit card fraud.
(Ma, 2020)	151	INTERNATIONAL JOURNAL OF RESEARCH IN MARKETING	This document focuses on the application of machine learning and artificial intelligence (AI) in the field of marketing. The authors aim to explore the potential of these technologies in enhancing marketing strategies and decision-making processes by leveraging computing power and connecting it with human insights.

Source: elaborated by authors based on R studio Biblioshiny and Scopus via CSV

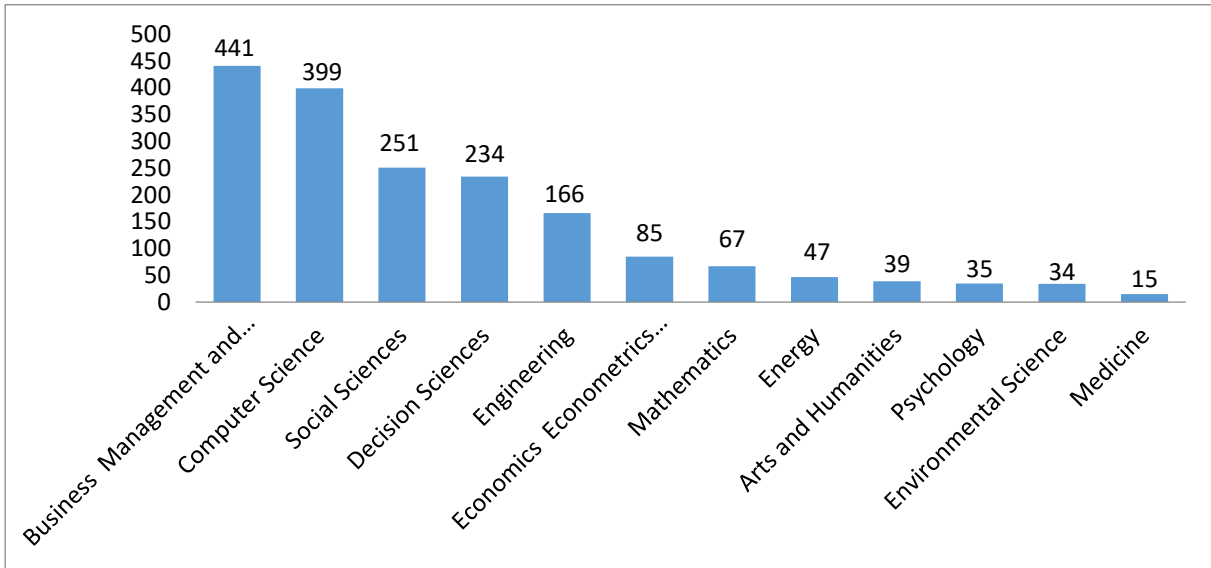


Figure 4. The Distribution of Disciplines

Source: elaborated by authors using Excel tables based on data extracted from Scopus

3.3 Analysis of the Literature Countries, Journals, and Authors

The map below is composed of three coloured zones: gray (no field contribution), light blue (field contributions less than dark blue), and so on. Further information can be found in Figure 5.

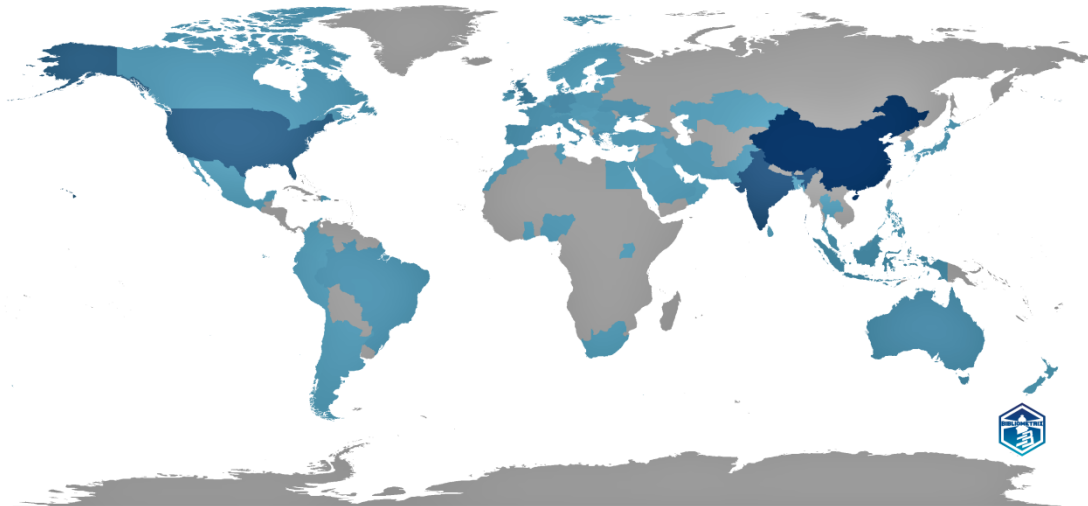


Figure 5. Country Collaboration Map

Source: elaborated from a Scopus dataset via R Studio-based Biblioshiny

China is ranked first among the top twenty countries with corresponding authors according to the data in

Table 3. 98 papers have been written by corresponding authors from China, of which 19 are multi country publications (MCP) and 79 are single-country publications (SCP). Publications that span several nations have at least one international co-author.

Table 3. The leading productive countries

Country	Articles	SCP	MCP	MCP_Ratio
CHINA	98	79	19	0.194
INDIA	55	49	6	0.109
USA	38	31	7	0.184
UNITED KINGDOM	20	10	10	0.500
KOREA	13	7	6	0.462
AUSTRALIA	10	5	5	0.500
GERMANY	10	6	4	0.400
SPAIN	10	5	5	0.500
HONG KONG	7	4	3	0.429
FRANCE	6	3	3	0.500
GREECE	6	6	0	0.000
IRAN	6	4	2	0.333
PORTUGAL	6	4	2	0.333
FINLAND	5	1	4	0.800
POLAND	5	4	1	0.200
CANADA	4	2	2	0.500
INDONESIA	4	2	2	0.500
NETHERLANDS	4	3	1	0.250
PAKISTAN	4	1	3	0.750
BRAZIL	3	2	1	0.333

Source: elaborated by the authors on the basis of Studio R Biblioshiny and Scopus via CSV

With 55 articles of correspondence, 49 SCP, and 6 MCP, India comes in second. There are 38 publications in the United States of America, 31 of which are SCPs and seven MCPs. With 20 research articles on Artificial Intelligence in Electronic Commerce, the United Kingdom is in fourth place. Both its SCP and MCP are tens, with 13 corresponding research articles (SCP: 7, MCP: 6), Korea comes in fifth place. With ten articles (SCP—5, MCP—5), Australia is ranked sixth.

3.4 Distribution of literature by journals

Journals are an essential tool for disseminating knowledge and a key indicator of the calibre of a field's study. Scientific researchers can benefit from study on the appropriate dissemination of literature by journals, which can advise them on the fast screening of significant information and the selection of a platform for publishing research findings (Zhang Sheng-tai, 2020).

In this study, a total of 669 articles published in 329 journals were collected. **Table 4** shows the top 10 most productive journals in the field of artificial intelligence in electronic commerce for the past 10 years. The top 4 journals with the highest output are Proceedings of the International Conference on Electronic Business (ICEB) (31), Sustainability (Switzerland) (23), Electronic Commerce Research and Applications (21), and Processing Lecture Notes in Business Information (21), accounting for 5.00%, 3%, 3%, and 3%, respectively. Given that the percentage of publications in these leading journals is not very high, the fact that they represent 16.5% of all publications indicates that there are many research-related journals in this field.

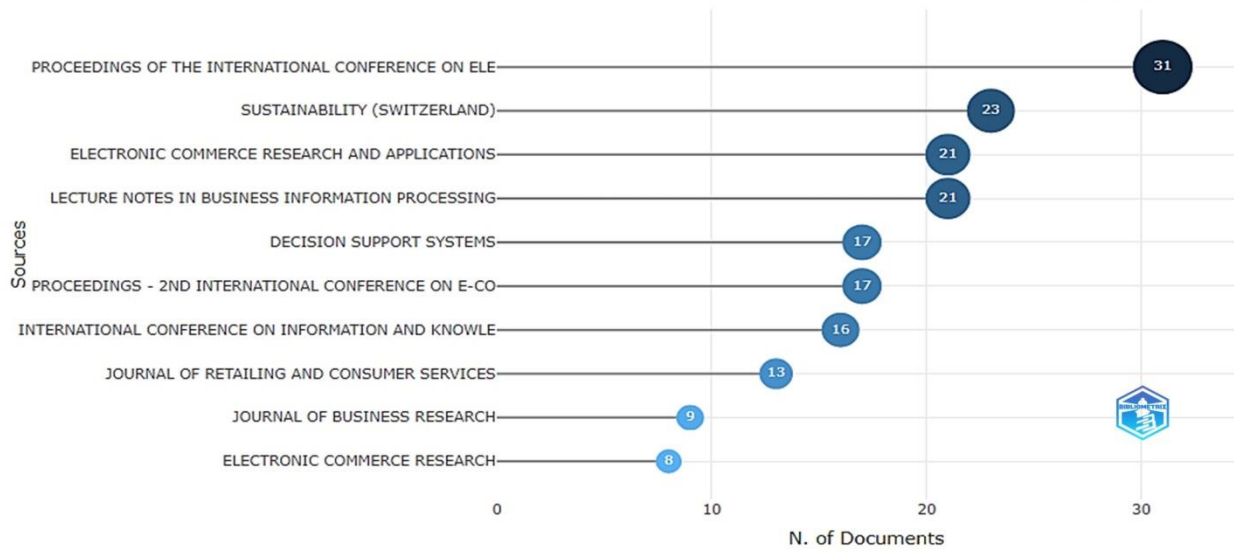


Figure 6. Journal distribution of the literature

Source: elaborated with a dataset with from Scopus via Biblioshiny based on R Studio

Table 4. The leading productive countries

Journals	TP	TP%
Proceedings of the International Conference on Electronic Business (ICEB)	31	5%
Sustainability (Switzerland)	23	3%
Electronic Commerce Research and Applications	21	3%
Processing Lecture Notes in Business Information	21	3%
Decision Support Systems	17	3%
Proceedings – 2 nd International Conference on E-Commerce and Internet Technology, ECIT 2021.	17	3%
The International Conference on Information and Knowledge Management, Proceedings	16	2%
Journal of Retailing and Consumer Services	13	2%
Journal of Business Research	9	1%
Electronic Commerce Research	8	1%

Source: elaborated by the authors based on R studio Biblioshiny and Scopus via CSV

3.5 Thematic Evolution

Thematic evolution is a method for the identification and visualisation of new research streams and sub-fields in a particular specific research area by integrating performance analysis and scientific mapping (Wu P.-S. , 2017).

Thematic evolution and mapping were carried out using the biblioshiny application, and the results are presented in Figure 7 and **Figure 8**. The thematic map shows the important themes in the development stages of artificial intelligence research in e-commerce Figure 7.

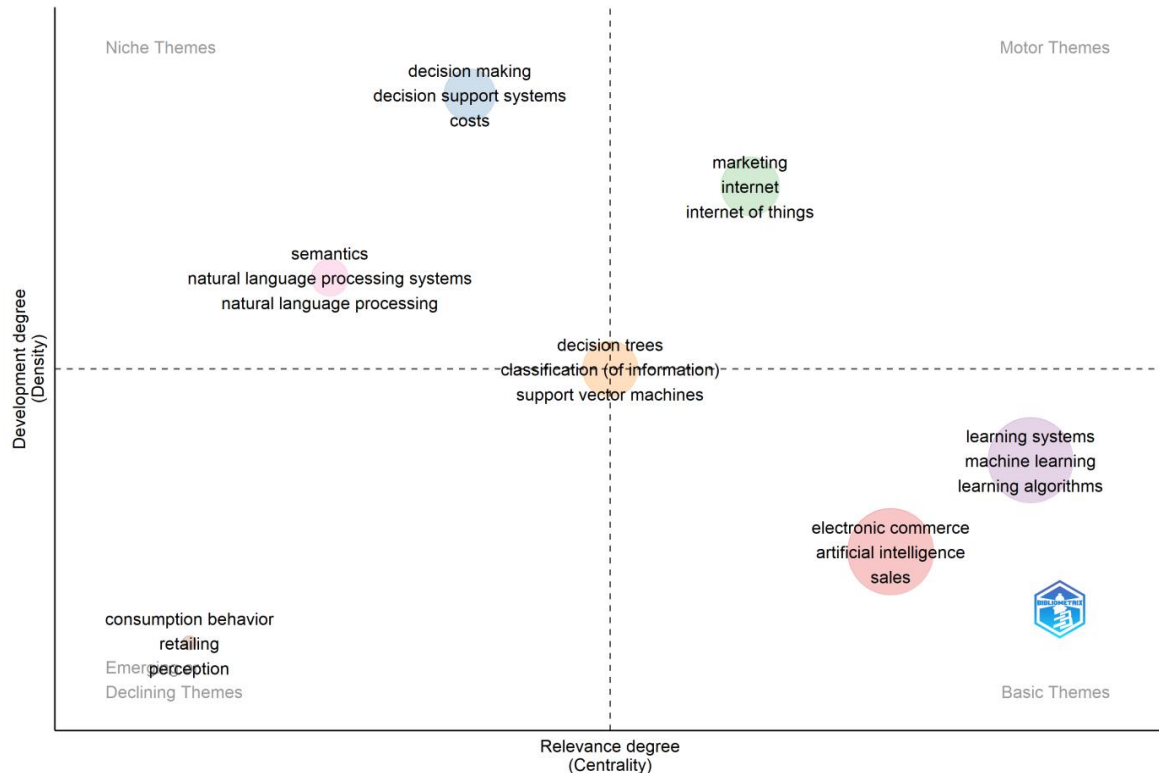


Figure 7. Thematic Map

Source: elaborated from a Scopus dataset via R Studio-based Biblioshiny

The map's four quadrants present basic themes, emerging or declining themes, niche themes and driving themes. For example, decision making, decision support systems, costs, supply chain, reinforcement learning, e-commerce and intelligent agents are the niche themes that indicate that research is progressing in these areas of application of artificial intelligence in e-commerce. Marketing, the Internet, the Internet of Things, data analytics, digital marketing, sustainability, consumer behaviour, digital technologies and 5g mobile communication systems are the driving themes, i.e. they are the main lines of research and are being addressed as a priority. E-commerce, artificial intelligence, sales, learning systems, machine learning, websites and learning algorithms are the basic themes of research into artificial intelligence in e-commerce. Consumer behaviour, retailing, technology adoption, shopping activity and cognition are emerging themes and grouped around emerging themes.

In addition to the thematic map, Figure 8 also includes a three-field diagram of the evolution of research. The link between an author's keyword (left), author (center), and title (right), as well as how they changed over time, are depicted in the figure. The majority of the keywords that authors employ is very similar to the words that appear in the article titles.

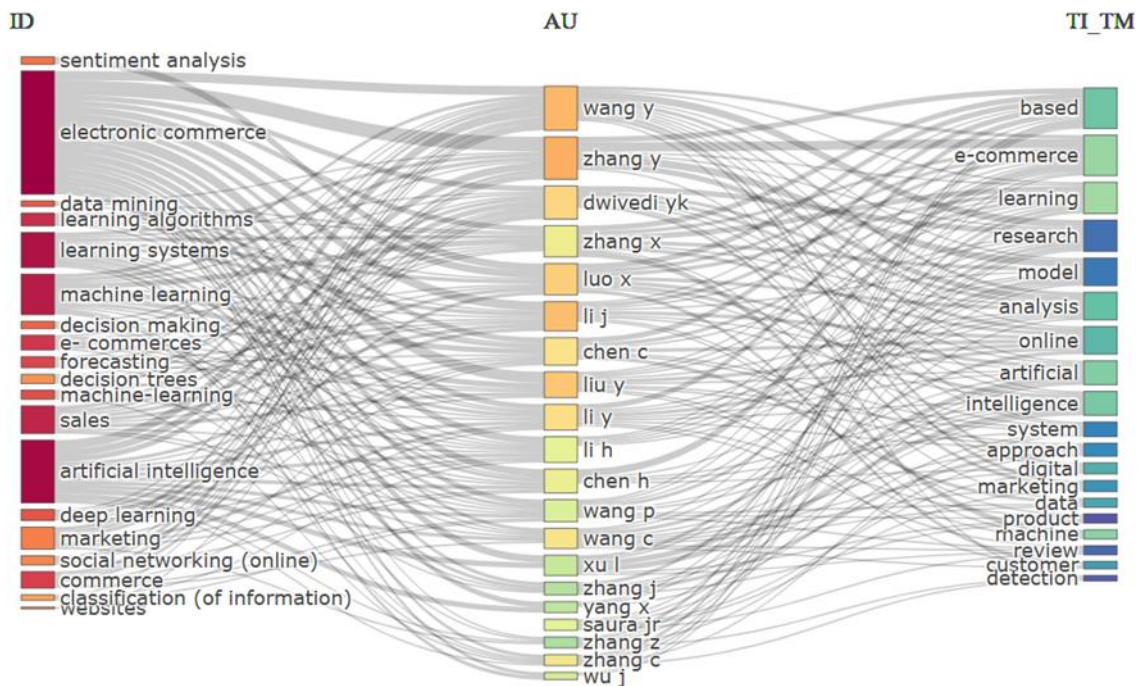


Figure 8. Three Field Plot

Source: elaborated from a Scopus dataset via Biblioshiny based on R Studio

4. RESULTS AND DISCUSSION

In this section, co-author analysis, citation analysis, and keyword co-occurrence analysis are used to examine hotspots and trends in exploratory research in this field of study. Co-author analysis is a technique used to map the global network of author collaboration (Wu et al., 2021), enabling researchers to examine international, institutional, and individual collaboration on AI in e-commerce. The mapping framework for establishing relationships between journals, authors and literature in a particular research area is established using co-citation analysis. By examining the article's keywords, hotspots, and cutting-edge issues in the research field are identified at the end of this section.

4.1 Co-Authorship Analysis

Co-authorship (Authors), with the co-authorship option in VOSViewer, authors who coauthored the documents can be examined. The relationships between the items (such as authors) were represented using the co-authorship analysis. The link strength was used to indicate it. As a result, the total link strength (TLS) showed the extent to which one author contributed to the work of another (Van Eck N. J., 2013; Van Eck & Waltman, 2017).

A variety of threshold settings were used. There could be a maximum of 25 authors per document. A writer has to have written a minimum of one document. The required minimum citation count remained at 0. The 395 items (e.g., authors) all met the threshold. According to the findings, Wang Y. had the highest total link strength (TLS) of 46 with 08 documents and 509 citations, followed by Zhang Y. (TLS, 09; Documents, 45; Citations, 40). Table 5 lists the top 50 authors who have co-authored works.

Table 5. List of 50 Authors Having Highest TLS

S/No	Item (authors)	Docu-ments	Citatio-ns	TLS	S/No	Item (authors)	Docu-ments	Citatio-ns	TL S
1	Wang Y	8	509	46	26	Krishen A S	1	448	17
2	Zhang Y	9	45	40	27	Kumar V	1	448	17
3	Dwivedi Y.K	6	834	38	28	Li Y	6	79	17
4	Zhang Z	4	20	29	29	Luo X	7	27	17
5	Zhang C	5	15	27	30	Rahman M.M	1	448	17
6	Gai K	2	22	26	31	Raman R	1	448	17
7	Chen C	5	10	22	32	Rauschnabel P.A	1	448	17
8	Liu C	3	16	22	33	Rowley J	1	448	17
9	Zhu X	2	58	21	34	Salo J	1	448	17
10	Filieri R	2	451	20	35	Tran G.A	1	448	17
11	Liu Y	7	21	19	36	Wang J	3	63	17
12	Wang P	4	33	19	37	Zhao I	2	67	17
13	Dzyubyk I	2	69	18	38	Zhao Y	4	5	17
14	Liu H	2	18	18	39	Chen K	3	18	16
15	Iytyvn V	2	69	18	40	Li J	7	63	16
16	Petruchenko O	2	69	18	41	Zhang X	5	7	16
17	Vysotska V	2	69	18	42	Ge T	1	16	15
18	Carlson J	1	448	17	43	Hu Z	1	16	15
19	Chen H	4	14	17	44	Huang S	1	16	15
20	Hughes D.I	1	448	17	45	Li H	4	8	15
21	Ismagilova E	1	448	17	46	Liu B	1	16	15
22	Jacobson J	1	448	17	47	Sun P	1	16	15
23	Jain V	1	448	17	48	Wu J	4	17	15
24	Karjaluo H	1	448	17	49	Xu J	2	7	15
25	Kefi H	1	448	17	50	Yi H	2	24	15

Source: VOSViewer outputs

Among the 1909 authors. There are 1835 co-authorships in the database; they also have a strong link, as shown in Figure 9. Zhang Y has emerged as the most collaborative authorship.

After that, we looked at the co-authorship analysis for countries. It displayed the connections between countries that collaborated and forged alliances with other nations to publish the documents. Their ties will be stronger the closer these nations are closer. Additionally, the stronger the bond between them, the thicker the links between them (Van Eck N. J., 2013; Van Eck & Waltman, 2017).

While mapping the data, we used several thresholds. The maximum a country may have was 25 documents. A country needed a minimum of one document. A country had to have 00 citations in order to be considered. As a result, 65 items (countries) met the requirement. According on their TLS scores, analysis revealed widespread collaboration and association among other nations. With 53 documents and 1941 citations, the United Kingdom had the highest TLS (69) among other nations. It was followed by China, the United States, and others mentioned in Table 6.

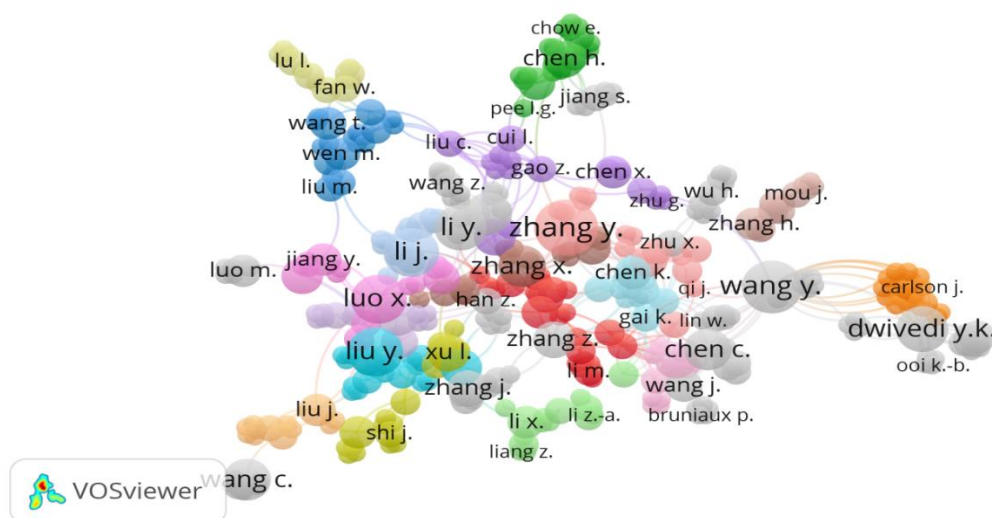


Figure 9. Map of the Author Co-Authorship Analysis

Source: created by authors using VOSViewer outputs

Table 6. List of 50 Countries Having Highest TLS

S/No	Item (Country)	Documents	Citations	TL S	S/No	Item(Country)	Documents	Citations	TL S
1	United Kingdom	53	1941	69	26	Pakistan	8	102	6
2	China	156	1144	67	27	Unites Arab Emirates	8	20	6
3	United States	100	2799	65	28	Belgium	3	8	5
4	India	118	1866	47	29	Iran	10	141	5
5	Australia	29	978	35	30	Morocco	4	61	5
6	Germany	25	1050	21	31	Bulgaria	4	0	4
7	France	13	753	19	32	Macau	3	3	4
8	Canada	14	706	18	33	Vietnam	6	84	4
9	Hong Kong	21	227	18	34	Attica	1	1	3
10	Finland	7	528	15	35	Austria	4	33	3
11	Spain	18	360	15	36	Bahrain	2	13	3
12	Malaysia	14	270	12	37	Czech Republic	7	14	3
13	Netherlands	10	148	12	38	Dominican Republic	1	46	3
14	Singapore	10	174	12	39	Greece	11	31	3
15	Saudi Arabia	12	123	11	40	Kazakhstan	2	0	3
16	Taiwan	26	259	9	41	Qatar	1	46	3
17	Portugal	14	195	8	42	Slovakia	5	18	3
18	South Korea	16	114	8	43	Thailand	4	60	3
19	Switzerland	10	130	8	44	Bangladesh	4	15	2
20	Turkey	09	83	8	45	Colombia	1	3	2
21	Indonesia	17	52	7	46	Ghana	2	10	2
22	Ireland	4	25	7	47	Japan	3	41	2
23	Brazil	8	31	6	48	Latvia	1	0	2
24	Italy	14	223	6	49	Nigeria	3	1	2
25	Jordan	6	13	6	50	Oman	2	5	2

Source: VOSViewer outputs

Figure 10 highlights a network analysis of the co-authorship of several nations. The minimum number of documents is set at 1. The size of circles shows how many documents each country has appeared in. The greater the size of the circle, the more frequently those papers occur in that nation. Collaboration between the two countries is all the stronger for the thicker the connecting line.

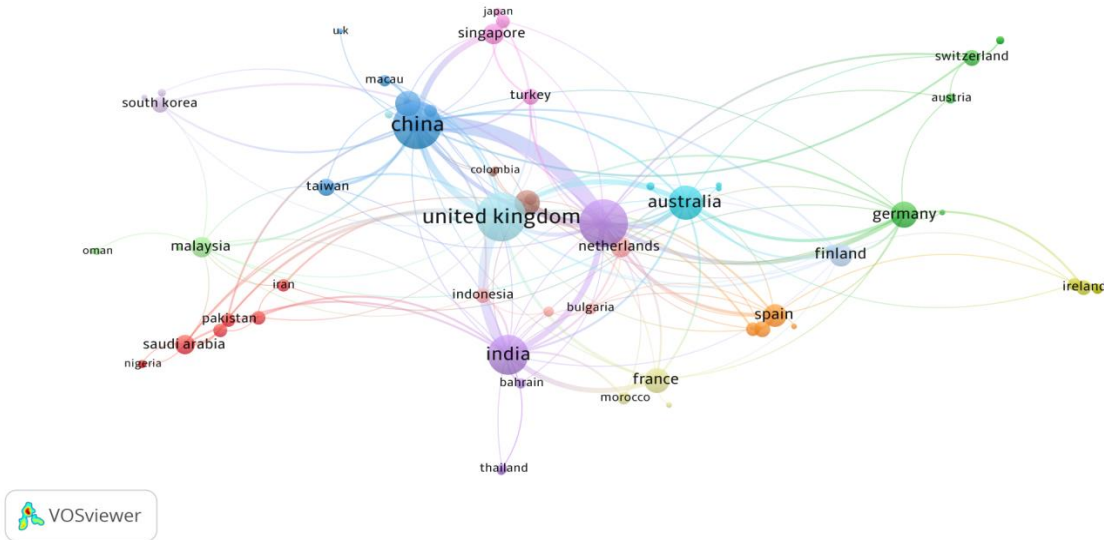


Figure 10. Co-Authorship between Countries
 Source: created by authors using VOSViewer outputs

Analysis of the network of co-author countries shows that a total of 88 countries are represented by authors collaborating on the literature on artificial intelligence in e-commerce. The United Kingdom is the top country with best total link strength.

4.2 Co-Citations Analysis

Co-citation Analysis refers to the citations of two documents by third document. With 669 papers, we expanded our study to include co-citation analysis based on cited authors. We specified a minimum of 20 citations for an author, and 282 of the 41212 authors were cited.

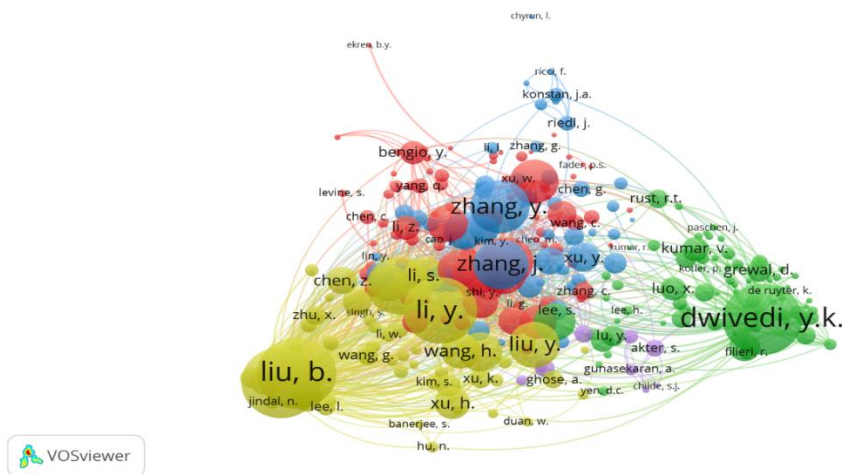


Figure 11. Author Co-Citation Network
 Source: created by authors using VOSViewer outputs

The greatest collection of linked objects (authors cited) was displayed as a map in Figure 11 and had 282 items. The connected set of co-citation analysis's map revealed the author who was most frequently mentioned by other authors. With 154 citations and 8165 total links, Dwivedi Y.K. was the author most frequently cited by other papers. Dwivedi Y.K. was next followed by Liu. B., who had 132 citations and 8138 total link strength, Cambria. E., who had 55 citations and 8078 TLS, Li. Y., who had 143 citations and 7598 TLS, and Wang. J., who had 121 citations and 6666 TLS.

4.2 Analysis Keyword Co-Occurrence Analysis

In essence, analysis of keyword co-occurrence is a semantic measurement of the keywords used in scientific literature and is a technique for discovering commonalities in the content of the literature (Corvo et al., 2021). Figure 12 shows the results of the author's keyword co-occurrence network study. The criterion for a term was set at 5, and 66 keywords that met it were included in the network building. The network created in this way comprises eight clusters that feature new research themes on the use of artificial intelligence technologies in electronic commerce.

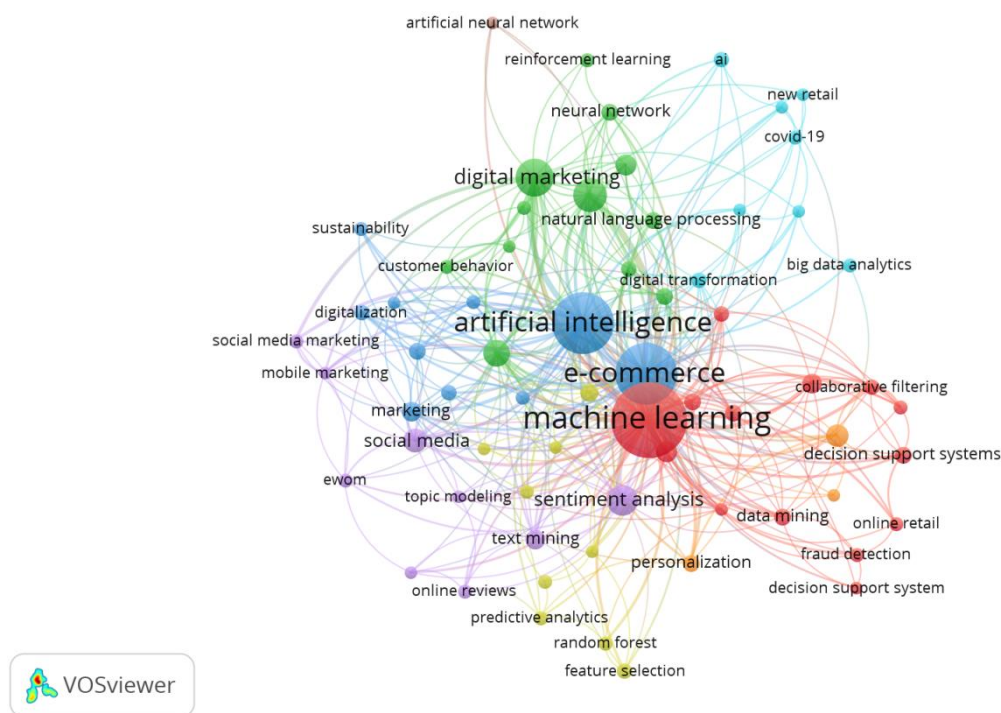


Figure 12. Keywords Co-Occurrence Network

Source: created by authors using VOSViewer outputs

With 14 terms, the red cluster is the largest in the network. Machine learning, e-commerce, recommender systems, data mining, fraud detection, decision support systems, online retailing, and others are some of the major terms in this category. This group focuses on the application of the technologies in electronic commerce, particularly the potential of artificial intelligence in a variety of e-commerce applications. These terms highlight the advantages of artificial intelligence, emphasising that machine learning, data mining, and recommendation systems are crucial for enhancing the entire shopping experience. AI-powered systems may make individualised product recommendations by evaluating enormous volumes of data, which

improves consumer happiness and increases conversion rates. The extensive security measures offered by AI's fraud detection capabilities also protect sensitive client data and stop fraudulent transactions. Additionally, by integrating decision support systems, merchants can increase operational productivity and cost-effectiveness by optimising their pricing and inventory management plans. Overall, AI-driven solutions enable e-commerce platforms to provide seamless, effective, and tailored services, cultivating long-lasting client loyalty and spurring business expansion (Carneiro, 2017).

5. CONCLUSIONS

The present study quantitatively examined the research conducted on artificial intelligence in e-commerce since 2014 to July 2023. The research methodology comprised four steps: (1) research design, (2) bibliographic data retrieval that resulted in 669 articles from the Scopus database, (3) bibliometric analysis, and (4) interpretation of findings. Scientific interest in the field of artificial intelligence in e-commerce has been growing steadily since 1994, and has intensified since 2018; between 2018 and 2022; publications are expected to grow by about 256.10%, with journal articles being the most common type of document in the field, accounting for over 66% of the 669 handwritten contributions.; of all the literature samples, the article by Xiang, Zheng (2017) was co-cited 478 times received the highest number of citations. Furthermore, business, management, and accounting make up the majority of the research topic's percentage (26.8%). In terms of global production, the findings show that the most productive review is Proceedings of the International Conference on Electronic Business (ICEB), which is ranked first in terms of scientific productivity.

According to the results, the United Kingdom published the most publications (53), followed by China and then the United States. Among co-authors, the country having the most total link strength is the United Kingdom. Analysis of co-citations based on cited authors revealed that Dwivedi Y.K. was the most frequently cited author, with 154 citations and a total link strength of 8165, followed by Liu. B (132 citations, 8138 TLS), among a total of 282 cited authors out of the 41212 authors analysed in our study. Keywords co-occurrence network indicates that prominent keywords are machine learning, electronic commerce, recommender system, fraud detection, decision support system, data mining, and online retail. Research can be categorised into different groups of interest that vary over time. The current focus is on decision-making, the supply chain, and reinforcement learning.

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