Artificial intelligence in online shopping: A bibliometric analysis through R Studio from 2000 to 2023

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Abstract: *This study aims to provide a bibliometric overview of Artificial intelligence (AI) research in online shopping from 2000 to 2023 and to identify significant trends. WOB was utilized to retrieve data from 1488 selected articles from 281 different sources. The methodology included science mapping with bibliometric indicators such as citations, co-citation analysis, and bibliometric coupling. Analysis of the data was done using R-package using Biblio-shiny. The findings indicate an increase in the number of articles and authors per paper that highlight AI in online shopping key issues, the most promising AI practices, and the topics for future research. This study has significant importance to orient AI process towards the assessment of the customers satisfaction and trust*

Key words: *artificial intelligent, online shopping, bibliometric analysis*

1. INTRODUCTION

Artificial intelligence (AI) has changed internet buying [1]. Artificial intelligence (AI) can completely change how companies communicate with their customers[2]. AI is different from human intelligence in that it relies on quick data processing. The broad definition of intelligence in AI is the capacity to interpret and convert input into information to guide goal-directed behavior[3]. More specifically, AI refers to "computational agents that act intelligently"[4]" Designed to replicate the capacity of human strength while overcoming their ability for precision[5]. This is achieved by using a collection of computational models to simulate biological and natural intelligence[6].

Companies are embracing AI technology backed by data analytics in response to higher consumer expectations, faster strategy cycles, and ongoing margin pressures. Better customer-brand connections may be possible as a result of this shift in how businesses engage with their customers[7]. In particular, AI

advancements may help businesses better understand their consumers' tastes and buying habits, which in turn might lead to an enhanced customer experience[8]. This suggests that businesses stand to gain a lot and customers stand to gain even more by strategically deploying AI technology at several critical consumer touchpoints.

Artificial intelligence (AI) is finding several uses in the retail industry, including chatbots, content creation, and consumer analytics[9]. If retailers want to target the top 1% of customers, who are worth 18 times more than normal customers, they may use AI, according to previous research. This is accomplished by using contextual and behavioral data to create high adaptation and boost engagement[10]. Retailers will invest $7.3 billion in artificial intelligence by 2022, according to Juniper Research. This is a significant increase from the $2 billion invested in 2018[11]. Also, from an estimated $3.6 billion in 2019, the worldwide retail industry will spend $12 billion on AI services by 2023[12]. More than 325,000 stores are predicted to use AI systems throughout the same time frame[13].

By analyzing a consumer's prior purchases and preferences, AI technology may tailor services and product suggestions to their unique needs. This has far-reaching consequences for many industries, including the ability of cosmetics companies to efficiently create customer-specific designs and product suggestions[14]. The potential benefits include enhanced automation, cost savings, flexibility, and improved customer relations. Deeper analysis and understanding of this complicated phenomenon is necessary for understanding its advantages[15]. In addition, consumers may have to give up certain aspects of their experience due to the lack of human connection or the extra work that may be necessary. These and other possible problems with AI-powered consumer experiences need to have their effects studied more thoroughly[16].

It might be worthwhile to explore the potential applications of bibliometrics in evaluating the many existing literature reviews on artificial intelligence in online retail. For the last three decades, an AI in an internet buying review has not yet used a bibliometrics approach to monitor the evolution of research trends. A broad overview of academic literature may be obtained by bibliometric analysis[17]. It makes use of mathematical and statistical techniques to investigate the formal aspects of knowledge domain[18]. According to Albort-Morant and Ribeiro-Soriano (2016), bibliometric analyses facilitate the process of finding, organizing, and evaluating vast volumes of data while additionally allowing historical analysis and forecasting of future scientific discoveries. These results point to a very apparent chance for researchers to assess their work using bibliometric analysis. This paper provides a bibliometric overview of AI within online research from 2000-2023, with implications for evaluating AI in online commerce. From 2000 to 2023, different topics were highlighted in AI research debates at various levels. This work contributes to the development of historical research designs for future AI in online commerce using bibliometrics analysis.

This study has filled a significant research gap using science mapping analysis, a general domain analysis and visualization process, and bibliometric coupling. The findings of this study will aid future researchers in comprehending the challenges linked to enhancing and upgrading artificial intelligence in the field of online buying. Additionally, this study will contribute to the existing body of knowledge on artificial intelligence (AI) in the field of online purchasing research. It will achieve this by analyzing bibliometric data from 1488 papers sourced from 281 different publications spanning the years 2000 to 2023. WOB is widely recognized as a highly comprehensive database in this field and was utilized for data retrieval[19]. A conceptual structure map[20] Sankey diagram[21] trend topic[22] word growth dynamics[23] Word tree map[24] were produced as part of the bibliometric study using the bibliometric-R package and biblio-shiny, a shiny software with a web interface for bibliometrics[25]. The use of numerous analyses serves to aid researchers in understanding the scope of this subject, its emerging patterns, and its development throughout time[26]. The goals of this research are:

1. What are the global trends in the publication and citation of AI in online shopping research?
2. What are the global coalition and essential connections between the different areas and countries based on authorship configurations?
3. Who are the leading players, sources, and countries in AI in online shopping research?
4. What are different kinds of new ideas coming in online purchasing with the help of AI?
5. What scholars at each stage have focused on different aspects and objectives?

In the subsequent section of this article, section two presents several methodologies, data sources, and the research design. Section three provides the findings of the bibliometric analysis, examines the key conclusions, and offers the graphical analyses. The fourth section of the document presents a discussion that is based on the findings of the analysis. It also includes information about the limitations of the study, its practical applications, and prospective areas for future research. The fifth section of the document contains the conclusion.

2. METHODOLOGY

Data organization and sampling:

WOS is a powerful database [27] and one of the top platform resources, containing more than 90 million academic articles including 22,012 journals (including Open Access journals); more than 304,000 conference proceedings; and more than 143,000 books selected by editors[28, 29]. In this study, only WOS is used because it is difficult to synchronize the bibliometric data obtained from two or more databases, reducing the likelihood of robust bibliometric analysis[30]. Moreover, using a single database for bibliometric analysis is standard and suitable[31].

Prisma flow diagram

The PRISMA () flow diagram is a visual tool utilized in systematic reviews to show the development of information across several stages of the review process. It usually contains information about the identification, screening, eligibility, and inclusion of research in the review. The PRISMA diagram below shows an explanation of artificial intelligence in the context of internet buying. The search strategy followed to collect the relevant data is as follows:

Three hundred thirty-five documents were deducted from research relevant to artificial intelligence in online shopping. Although the findings show the evolution of the concept in online shopping since 2000, only sixteen articles were written till 2022. The idea of online shopping seemed to find some boost in 2009. That's why the study was conducted over the two and half decades, i.e., from 2000 to 2023. After limiting the search to two and half decades and the English language, the count as 1488.

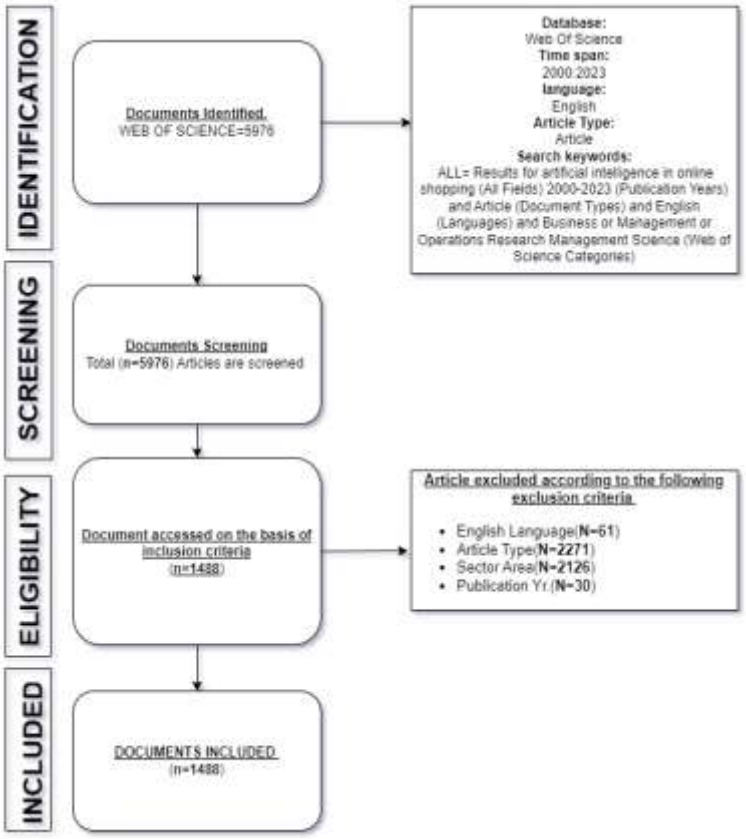

Fig. 1. PRISMA diagram below shows an explanation of artificial intelligence in the context of internet buying

Bibliometric Research design

Bibliometric analysis has become an essential tool for analyzing the scientific outputs of various scientific entities (such as papers, authors, keywords, journals, institutions, and countries) in any research field. It allows for the examination of how the intellectual, social, and conceptual structure of the relevant field has changed over time, by analyzing the relationships and interactions between these entities [30]. The primary objective of this study is to identify, assess, and understand the literature in a specific research field through bibliometric analysis[32]. Scholars have employed bibliometric analysis as a means of quantitatively representing various field in a comprehensive concise manners[33]. The biblio-shiny R-studio is utilized for this study [34] R-studio is statistical computation and visualization Integrated development environment Software(IDE's)[35]. We used the biblio-shiny interface for bibliometric analysis, which including word cloud[36], co-citation network analysis[37], thematic map[38], factorial analysis[39], and the creation of a specific three-field plot[40] to study the evolution of a research area. The following steps have been chosen to start the research search approach; as shown in Table 2.

Table 2: Analysis unit and Sub-Components.

Analysis Unit	Sub-Components
Data Set	Primary information about the data
	Annual scientific production
	Average citations per year
	Three-field plot
Sources	Most relevant sources
	Cite score publication per year
Authors	Most relevant authors
	Authors' contribution toward artificial intelligence in online shopping
	Country scientific production and citation analysis
	Corresponding authors countries
Document	Most globally cited articles
	Document by subject area and type
	Word cloud
Conceptual Structure	Thematic map
	Factorial Analysis
Intellectual Structure	Co-citation network

3. DATA ANALYSIS WITH KEY RESULTS*:*

Primary information about the data

An overview of the initial data summary is shown in Figure 2 demonstrate overview of this study's from 2000:2023 timespan , 281 sources , 1488 documents, 3138 authors, 4258 author's keyword, and 56078 references. Furthermore, this information has some valuable ratios are also exhibited, such as 19.42% annual growth rate, 27.15% international co authorship, 2.8 co-author per document, and 36.38 average citation per document.

Fig. 2. Summary of Initial Data.

Annual scientific production

Bibliometric analyzes the collection of scientific outputs by reviewing publications in a specific field or academic journal annually. By using numerical and statistical tools to analyze annual article production[41]. The results are shown in Table 3 with the year-wise publication count.

According to Table 3, These findings confirm the significance of artificial intelligence in online purchasing and indicate that the existing body of knowledge has been expanding with the addition of more publications

over time. Display the table for the year 2000, which shows that just 6 articles were produced in that year. In several subsequent years, there was an increase in the number of articles, Specifically, in 2009, there were 27 articles, and in 2023, the number rose significantly to 237. Moreover, Table 4 data was analyzed decade by decade. The findings reveal that publication trend is significantly rising with each passing decade.

TABLE 3: Annual Scientific Production**.**

Year	Articles	Year	Articles	Year	Articles
2000	4	2009	27	2018	101
2001	6	2010	34	2019	99
2002	6	2011	56	2020	115
2003	13	2012	36	2021	179
2004	7	2013	34	2022	199
2005	11	2014	38	2023	237
2006	14	2015	72		
2007	13	2016	87		
2008	10	2017	90		

Table 4: Production Trend Analysis.

Decade	Articles	Art/decade	change in trend
2000-2009	111	11.1	
2010-2019	647	64.7	5.82
2020-2023	730	182.5	1.12

Average citation per year

Table 5 presents an extensive overview of the annual citation with corresponding years in which they were cited. Moreover, Statistical analysis indicates that 604 is maximum average number of citations per article reached in year 2000, while the average number of citations per year reached its maximum level in the same year at 24.16.

Table 5: Average citation per year.

Year	Mean TC per Art	N	Mean TC per Year	Citable Years
2000	604	4.00	24.16	25
2001	575	6.00	23.96	24
2002	434.83	6.00	18.91	23
2003	211.77	13.00	9.63	22
2004	169	7.00	8.05	21
2005	92.36	11.00	4.62	20
2006	154.21	14.00	8.12	19
2007	124.62	13.00	6.92	18
2008	93.6	10.00	5.51	17

2009	82.33	27.00	5.15	16
2010	58.94	34.00	3.93	15
2011	62.07	56.00	4.43	14
2012	77.64	36.00	5.97	13
2013	60.29	34.00	5.02	12
2014	53.39	38.00	4.85	11
2015	38.47	72.00	3.85	10
2016	36.44	87.00	4.05	9
2017	36.34	90.00	4.54	8
2018	28.96	101.00	4.14	7
2019	24.6	99.00	4.10	6
2020	20.37	115.00	4.07	5
2021	14.48	179.00	3.62	4
2022	7.12	199.00	2.37	3
2023	2.11	237.00	1.05	2

N = number of publications, TC= Total Citations, Cit. = Citations

Three-fields plot

In 1898, Captain Matthew Sankey invented the Sankey diagram[42]. The Sankey flow diagram is a data visualization approach that highlights change of data from one condition or time to another. Originally employed in physics and engineering to visualize energy flow, it has since gained popularity in economics and business for analyzing intricate multi-step processes[43]. In fig 3 demonstrate which journals are writing the most on theme. The authors are listed in the center, while the sources are displayed on left, similarly the keywords are listed on right. The thicknesses in a three-field plot correspond to respective quantities and numbers. (Soundararajan & associates, 2014). According to Fig. 3, the edge thicknesses derived from keywords such as "e-commerce" and "online shopping" are the widest, indicating that these keywords are used by a variety of authors and journals in their articles. Journals like "Internet Research" and "Asia pacific journal of marketing and logistic" have also used a greater number of terms than other publications. Similarly, wang x and benbasat i is on top of list.

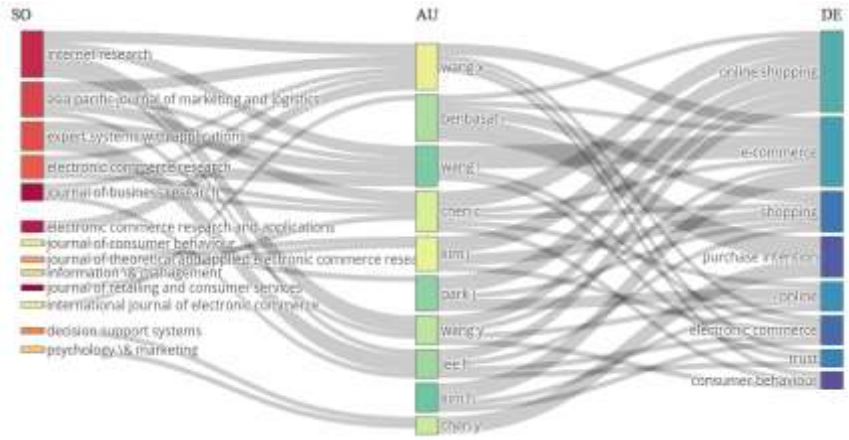

Fig. 3. Source-Authors-Keywords.

Most relevant sources

The top ten relevant journals in the relevant domain are shown in Table 6 below. "Journal of Retailing and Consumer Services" has the most publications (84), while "Journal of Business Research" with 53 documents on 2nd number. Similarly, "Electronic Commerce Research and Applications" is with 50 articles on 3rd stage.

Table 6: Most Relevant Sources:

Sources	Articles
JOURNAL OF RETAILING AND CONSUMER SERVICES	84
JOURNAL OF BUSINESS RESEARCH	53
ELECTRONIC COMMERCE RESEARCH AND APPLICATIONS	50
INTERNET RESEARCH	43
INTERNATIONAL JOURNAL OF RETAIL \& DISTRIBUTION MANAGEMENT	36
ASIA PACIFIC JOURNAL OF MARKETING AND LOGISTICS	33
EXPERT SYSTEMS WITH APPLICATIONS	32
ELECTRONIC COMMERCE RESEARCH	31
JOURNAL OF INTERNET COMMERCE	31
PACIFIC BUSINESS REVIEW INTERNATIONAL	31

Annual Publication per year:

The line graph in Fig. 4 below, which ranks the Journals according to the total number of publications and citations in the field of AI in online shopping. Moreover, the majority of research publications were produced in Journal of retailing and consumer service and journal of business research.

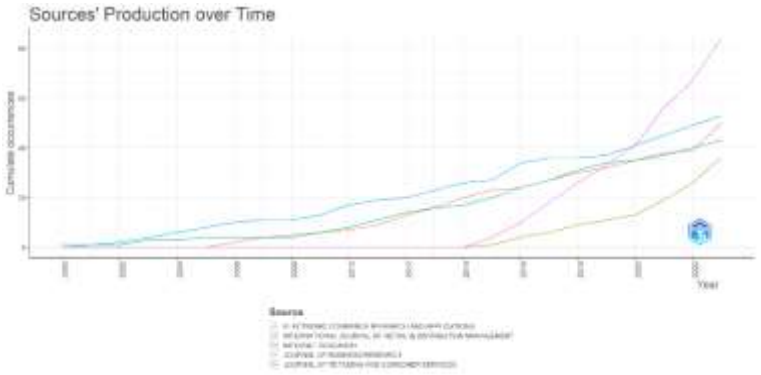

Fig. 4. Line graph showing ranks.

Most relevant authors

Figure 4a illustrates the relation between authors' quantity of articles, while Figure 4b depicts the number of fractionalized documents. Wang X, affiliated with Beijing institute of China, appears to be at the top of the list with 19 relevant articles and 5.2 fractionalized article. His research concentrated on many important

topics linked to artificial intelligence facilitated online shopping, such as the development and application of AI in China. Jee Yeon Kim from National Sun Yat-Sen University is ranked second on the list, with 15 articles that are relevant and 5.9 articles that are fractionalized. His research focuses on several important areas, such as text mining, big data, omnichannel retailing, digital marketing, and the impact of the performance and perceived value of different university services on the overall student experience and the major problems the university has been trying to solve.

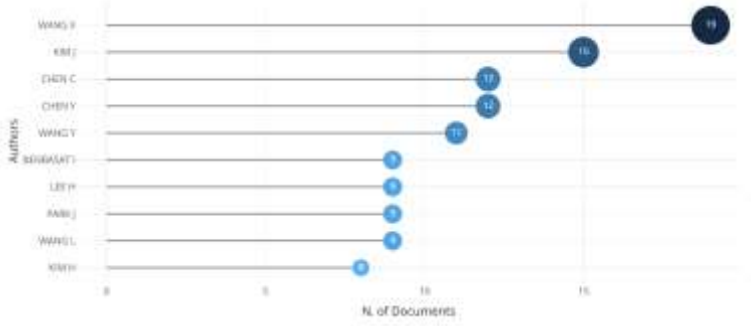

Fig. 4a. Most prominent authors in fractionalized document research.

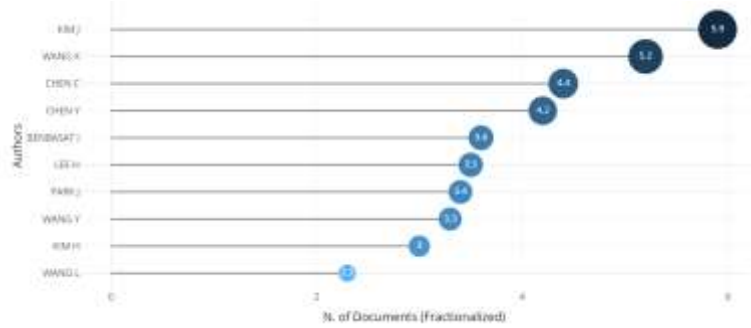

Fig. 4b. Most prominent authors in quality of article research.

Authors' contribution towards AI in online shopping issues

Table 8 lists the key points raised by leading experts in this field in published articles that have immediate effects on the impact on society. WANG X speaks on loyalty. In the fast-growing world of fresh food e-commerce, client loyalty is crucial to success. Kim J explains Digital technology can lead to reduced social engagement and increase psychological harm, and security issues.

Table 8: Authors' contribution toward artificial intelligence in online shopping.

Author	Paper title	Issues discussed
Wang X	Sustaining customer loyalty of fresh food e-tailers an empirical study in China	With the rapid development of fresh food e-commerce, sustaining customer loyalty is becoming critical for fresh food e-tailers to be competitive.

Kim J	Understanding digital consumers wellbeing in Asia the moderating roles of digital natives and privacy concerns	Digital technologies facilitate efficient connections, innovation, and resource discovery. Moreover, digital technology can lead to shallow peer interaction, psychological damage, and unwanted tensions owing to security concerns.
Chen C	Technology roadmap of ai applications in the retail industry	Retailers have taken the initiative to adopt AI technology to clear any unsatisfied consumer expectations during their shopping experience and emphasize a new form of value-added shopping experience
Wang Y	Consumer search and purchase an empirical investigation of retargeting based on consumer online behaviors	How marketers can retarget consumers who have searched online but did not purchase, based on their search behaviors. To infer the relationship between search activities and preferences.
Park J	Do parasocial relationships and the quality of communication with ai shopping chatbots determine middle-aged women consumers continuance usage intentions	Today, AI-based personal assistants like Siri, Alexa, Google Assistant, and Bixby are part of people's daily lives. Use and communication with AI are becoming more common. Companies have added AI to their marketing platforms and services to follow this trend. The global pandemic has accelerated AI agent adoption in service industries due to social distancing.

Country scientific production & citation analysis

The ranking of countries according to the total production of publications and citations in the field of artificial intelligence in online shopping as shown in Table 9 and Fig. 5 below; this information is useful in understanding the geographic distribution of research output. Most scientific publications came from China on top with (983) documents, the United States with (929) on 2nd and then with India (500) documents. From table. it shows China is on top according to publication but 2nd with respect to total citation While, USA is 2nd according to citation but on a top with respect to total citation. Its means more competitive & quality work is coming from USA and European countries than Asian countries. demonstrating the global importance of artificial intelligence in online shopping.

Table 9: Country scientific production

Country	Frequency	RANKING	TOTAL CITATION	RANKING	Average Article Citations
USA	929	2	21107	1	77.30
CHINA	983	1	9340	2	31.40
UNITED KINGDOM	171	4	2960	3	67.30
KOREA	168	5	2483	4	45.10
INDIA	500	3	2335	5	13.70
GERMANY	134	6	1955	6	45.50
CANADA	103	8	1733	7	59.80
AUSTRALIA	120	7	1044	8	25.50
SPAIN	102	9	1038	9	28.80
BELGIUM	45	10	888	10	59.20

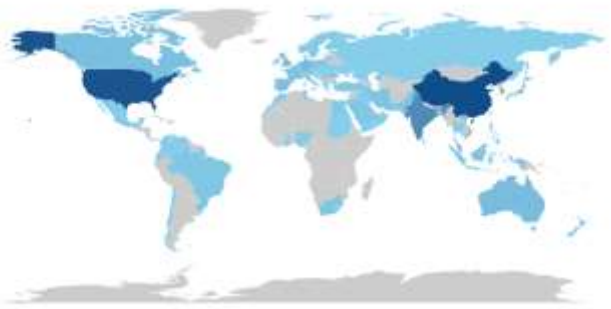

Fig. 5. Country scientific production.

Most relevant countries by corresponding authors

Table 10 shows the country of corresponding authors. For this purpose this analysis segmentize the, publications fall into two categories: multiple-country publications (MCP), which represents intra-country collaboration and single-country publications (SCP), which represent inter-country cooperation with authors from same region [44]. According to Table 10 MCP ratios, the two most productive countries are positioned in the middle. Furthermore, the countries that produce the most, like China and the USA, have low MCP ratios and are not highly ranked in terms of citations per article. This situation could be characterized as a finding highlighting the significance of global cooperation in increasing the quantity of citations per publication[45]. Moreover, we can clearly observe this in Fig 6 which exhibits the comparison bar chart between single country publications (SCP) and multiple country publications (MCP).

Table 10: Most Relevant Countries by Citation Analysis.

Country	Articles	SCP	MCP	Freq	MCP _Ratio
CHINA	297	215	82	0.2	0.276
USA	273	207	66	0.183	0.242
INDIA	171	160	11	0.115	0.064
KOREA	55	37	18	0.037	0.327
UNITED KINGDOM	44	25	19	0.03	0.432
GERMANY	43	33	10	0.029	0.233
AUSTRALIA	41	22	19	0.028	0.463
MALAYSIA	37	22	15	0.025	0.405
SPAIN	36	31	5	0.024	0.139
VIETNAM	31	26	5	0.021	0.161

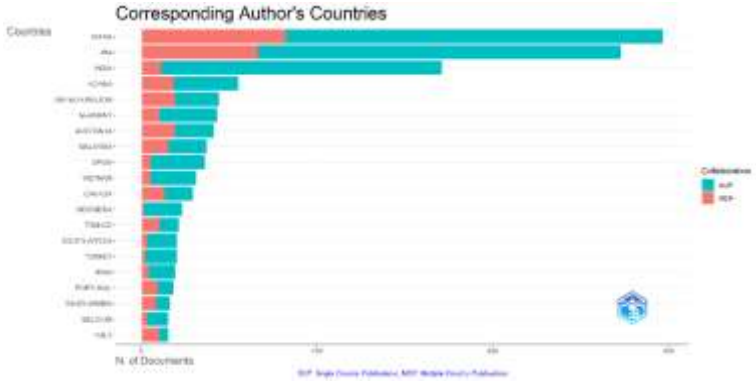

Fig. 6. Single country publications (SCP) and multiple country publications (MCP).

Documents Most Globally cited articles

Table 11 displays the list of the most widely cited papers in the field of artificial intelligence in online shopping. Show the pictorial representation of citations by authors and the bibliographic coupling of documents. The few most pertinent cited documents are listed below.

Table 11: Most Globally Cited Articles.

Papers	DOI	Total Citations	TC per Year	Normalized TC
Childers, Carr, Peck, & Carson, 2001	10.1016/S0022-4359(01)00056-2	1632	68.00	2.84
Novak, Hoffman, & Yung,2000	10.1287/mksc.19.1.22.15184	1578	63.12	2.61
Wolfinbarger & Gilly, 2003	10.1016/S0022-4359(03)00034-4	1142	51.91	5.39
McKinney, Yoon, & Zahedi, 2002	10.1287/isre.13.3.296.76	1040	45.22	2.39
Haubl & Trifts, 2000	10.1287/mksc.19.1.4.15178	808	32.32	1.34
Eroglu, Machleit, & Davis, 2001	10.1016/S0148-2963(99)00087-9	681	28.38	1.18
Devaraj, Fan, & Kohli, 2002	10.1287/isre.13.3.316.77	672	29.22	1.55
Forsythe & Shi, 2003	10.1016/S0148-2963(01)00273-9	623	28.32	2.94
Miyazaki & Fernandez, 2001	10.1111/j.1745-6606. 2001.tb00101.x	572	23.83	0.99
Wolfinbarger & Gilly, 2001	10.2307/41166074	559	23.29	0.97

Document by subject area and institute affiliations

Our research utilizes data from the Web of Science sources to analyze the subject areas and affiliations of individuals based on their institutions. Fig 8 shows a tree map of 1104 articles in business related field and 451 in management related field showing that artificial intelligence is mostly covered in both sectors. The kinds of documents that artificial intelligence in online shopping has published by the institutions are shown in Fig. 10. According to statistics, City University of Hong Kong has published the most articles on artificial intelligence in online shopping with 24, while Fudan University has published 9. The number of articles along with their institution affiliations is displayed.

Fig. 9. Document by subject area

Fig. 10. Document by institute

Keyword Tree Chart

A Tree Map can represent hierarchical information instead of a directed graph structure. In this space-constrained model, trees are contained and sub-trees are organized into subdivided rectangular parts using size and color coding[46].

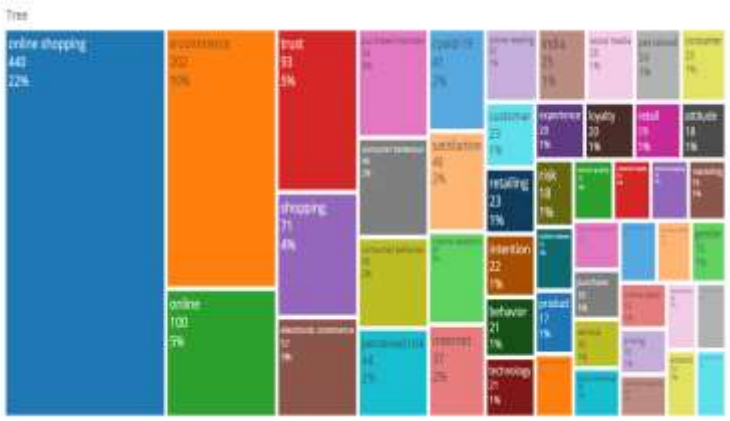

Fig. 12. Conceptual Structure

Thematic map

Fig. 12 shows the field's thematic history and the interesting changes in authors' keywords. Thematic development research themes fall into four types.

Firstly" Motor themes (Q1) with high centrality and intensity" refers to essential and prominent study subjects in the discipline. Centrality is the importance of a topic, whereas intensity is the level of concentration and focus given to it[44]. This section covers important and evolving topics in the research area. Fig. 12 shows that "online shopping, trust, e-commerce, and "buy intention" are the most explored keywords in clusters with high centrality and density. At t Niche themes (Q2) are research themes or topics that have attracted a lot of attention and developed to a high he 2nd degree but are not closely related to other areas of study. They are highly developed and isolated, with low centrality and a high level of development. In the niche themes quadrant, "perceived technology" and "retailing" are important themes. Thirdly Emerging or declining themes (Q3) with a low level of centrality and intensity refer to research themes or topics that are either new or fading in popularity and have a lower level of importance or attention than other areas in each field. "Consumer behavior" and "online retailing" are themes that need to be analyzed qualitatively to determine whether these themes are emerging or declining. Fourthly High centrality but low development level basic and transversal topics (Q4) refer to research themes or topics that are thought to be fundamental and cross-cutting but have either received less attention than other areas in each field or have not developed as much as other areas. The topics covered in this section will probably develop into important themes later. It is clear from the above map that "trust", "purchased intention" and "electronic commerce" are the themes that, as more and more publications are made on them, have the potential to emerge as dominant themes in the future. Furthermore, as more and more researchers focus on this topic, it is clear that "online retailing," which is positioned between Q3 and Q4, is an emerging trend with the potential to become a fundamental theme.

The results indicate that further work is required to create niche themes with more connections to motor themes, such as "perceived technology," "online retailing," "retail," and "consumer behavior." By encouraging perceived technology and online shopping in the retailing sector—two factor that are critical to artificial intelligence in online shopping ability to earn the public's trust and purchase intention—these issues have the potential to have a major impact on the online shopping.

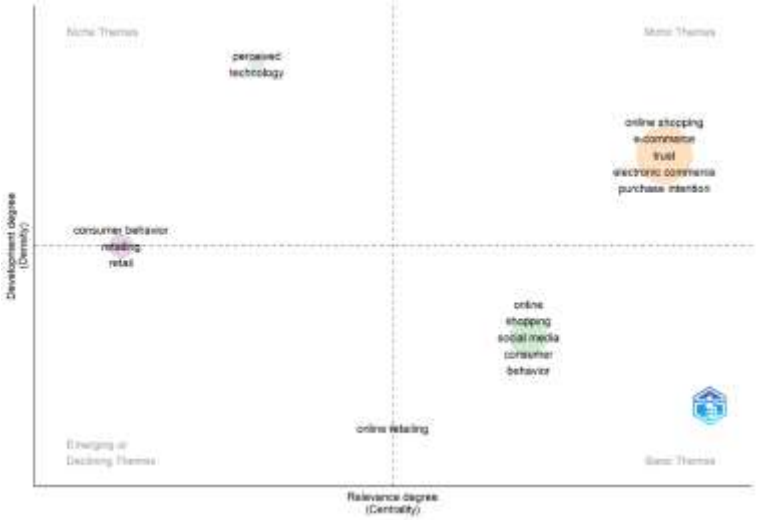

Fig. 12. Field's thematic history and the interesting changes in authors' keywords.

Factorial analysis

Multiple correspondence analysis (MCA) is a reduction techniques which is used to create a conceptual structure map[47]. MCA which is frequently used in categorical data analyses, particularly in the social sciences and marketing research, is an extension of correspondence analysis (CA) for more than two variables[48].

Fig.13 shows two different compositions of a conceptual structural map in red and blue. Words and phrases related to the internet and consumer behavior, such as "Satisfaction," "Purchase intention," "trust," "Electronic commerce," "Adoption," and "Perceived technology," are found in the red cluster. This suggests that they are comparable in both variables. Future studies could look into how technology affects customer perceptions about purchasing goods online. Moreover, the term "international cooperation" highlights the possibility that future studies will examine how businesses affect environmental impact, specifically in the context of online shopping behavior and other domains covered by this cluster. Terms like "loyalty," "consumer perceptions," "consumer satisfaction," and "consequences" are found in the blue cluster. Future studies could investigate how information technology and various technology acceptance models affect consumers' intentions to conduct business online.

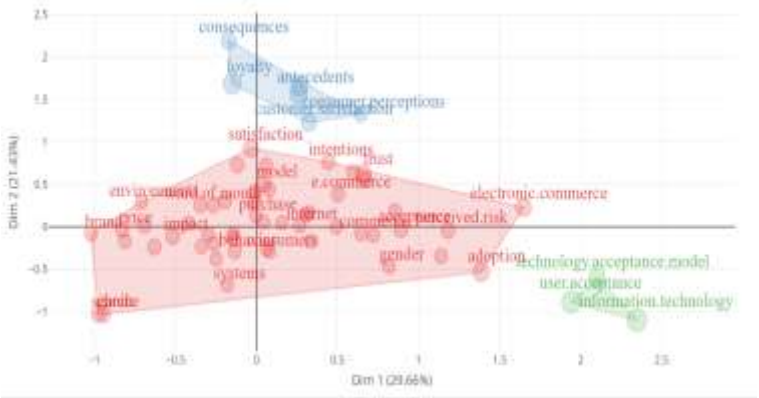

Fig. 13. Intellectual structure

Co-citation Network

Co-citation network analysis is a bibliometric analysis technique that examines co-citation patterns between publications in order to understand the intellectual structure of a field of study[49]. Co-citation is the practice of citing two or more publications in a third publication together, suggesting a connection between the two cited works[50]. In co-citation network analysis, significant research topics, prominent authors, and research clusters within a field are identified by building a network of publications based on their co-citation relationships and analyzing the network's topology[51].

Fig. 14 demonstrates that authors came from different backgrounds and used various perspectives. Like the blue cluster, which focuses on loyalty, consumers satisfaction, consumer perception and consequences of online shopping, the green cluster focuses on the technology acceptance model and information technology, and the red cluster focuses on electronic commerce, internet, perceived technology and consumer behavior by using various perspectives. The blue and red clusters have a similar research focus, while the green one has some differences in research focus, but it cites both clusters in their work. The analysis thus shows a wider perspective on AI in online shopping. The blue and red clusters share a common research focus, whereas the green cluster diverges in its research focus. However, the green cluster references both the blue and red clusters in its work. The analysis provides a broader outlook on the application of artificial intelligence in the context of online shopping.

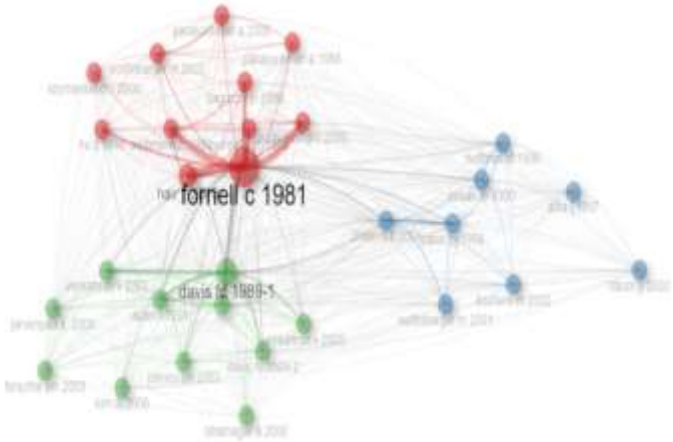

Fig.14: Different backgrounds and perspectives of authors.

4. DISCUSSION:

The advancement of artificial intelligence (AI) is promising, making it important to analyze its role in enhancing e-commerce efficiency and effectiveness[52]**.** This study identified the key players, countries, trends, collaborations, and sources of artificial intelligence in online shopping using bibliometric analysis. The results emphasize that previous developments in artificial intelligence in the domain of online commerce were mostly centered on the internal and external aspects of the company. Nevertheless, AI technology has gained significant importance in the domain of online business organizations in recent years. Artificial intelligence (AI) has the capability to use data analytics and other digital tools to gather and analyze information, therefore identifying potential areas for improvement. A number of factors, including changes in the global online business environment, the prominence of innovation and entrepreneurship in

online buying, and the expanding impact of technology on online commerce, will undoubtedly influence the future of artificial intelligence in online shopping. To effectively affect society, the results highlight the need of international collaboration among online businesses. Furthermore, Chinese people prioritize internet buying in their everyday lives. The research highlights the positive impact of AI on internet buying on society[53].

Researchers may get valuable insights on the worldwide coalition, leading journals, key players, and relevant countries from this study. It also covers trends in research publishing and citation. The research also demonstrates how AI is playing a vital role in e-commerce by facilitating the use of massive data sets to identify areas of concern. As you can see from table 10, the majority of publications and authorships on artificial intelligence in online commerce are coming from China, with the United States following in second. The United States of America (U.S.) and The United Kingdom (UK) are ranked at the top of the ranking for the most influential nations in AI research papers related to online shopping, based on the number of citations.

There are some new ideas in artificial intelligence in online shopping. Artificial intelligence may aid in the identification and prevention of fraudulent activities, therefore guaranteeing safe transactions and promoting confidence among clients[54]. Artificial intelligence (AI)-driven chatbots and virtual assistants provide immediate customer service, assisting consumers with queries, order monitoring, and product suggestions[55]. Artificial intelligence (AI) facilitates the ability to do visual searches, which allows consumers to search for things by utilizing images[56]. Voice-activated artificial intelligence (AI) assistants such as Amazon's Alexa and Google Assistant enable users to make purchases using voice commands[57]. Artificial intelligence (AI) assists merchants in optimizing inventory levels by accurately predicting demand and automating the restocking procedures[58]. AI algorithms analyze market circumstances, rival pricing, and consumer behavior to alter prices in real-time. Setting ideal product pricing maximizes retailer profits[59].

5. CONCLUSION

Online shopping is increasingly becoming a prominent sales channel for consumer products in China, contributing significantly to the market consumption economy. Online shopping provides convenient access to a wide range of products and services, including refrigerators, TVs, food, apparel, and cleaning services. The adoption of the digital economy has emerged as a popular strategy among leading nations and regions worldwide to redefine their global competitiveness. The digital economy has undergone a change that has enhanced old businesses and fostered the growth of emergent enterprises. The impact of online shopping on the traditional retail market is evident in the reduction of circulation costs and commodity prices, the expansion of choices, the acceleration of commodity circulation, the improvement of commodity circulation efficiency, and the promotion of logistical development. Nevertheless, the tendency for impulsive buying that accompanies online shopping often leads to avoidable wastage. The quality of internet merchants varies, making it challenging to ensure corporate integrity. There are vulnerabilities in network information security, which can lead to the easy disclosure of personal information. In order to promote a stable and healthy development of the online shopping market, it is imperative to enhance the existing regulations pertaining to e-commerce, bolster the oversight of the online market, and enhance the public's ability to discern and authenticate online buying transactions. In the future, as 5G and other technologies continue to grow, the market environment will be increasingly optimised, the platform ecology will improve, and the quality and brand will gradually enhance. The significant growth of e-commerce and social e-commerce is anticipated to have a profound impact, further driving the consumption potential of China's online retail business.

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