TECHNOLOGIES IN RETAIL – WITH A FOCUS ON CHATBOTS. A BIBLIOMETRIC ANALYSIS AND SYSTEMATIC REVIEW

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Abstract: This paper aims to carry out a bibliometric mapping and review of technology's importance in the retail industry, especially chatbots. This study delves into the characteristics of the articles published between 2019 and 2024 on artificial intelligence, chatbots, and retail. Through a comprehensive bibliometric analysis, we aim to uncover the trends in scientific literature. We used VOSviewer software for bibliometric analysis. We used search terms associated with retail chatbots and retail technologies. Based on the specialized literature review, the paper also presents possible future research directions, highlighting the opportunities for scientific exploitation of this research topic.

***Key words**:* chatbots in retail, technologies in retail, retail, customers, bibliometric analysis.

JEL Classification Codes: A1, M3, O3.

1. LITERATURE REVIEW

Central and Eastern European countries - such as Romania, Poland, Hungary, Bulgaria, and the Czech Republic - have witnessed a surge in online commerce in recent years, especially following the COVID-19 pandemic. Local retailers are increasingly embracing digital solutions to enhance customer relationships, with chatbots becoming an increasingly popular option for automated support (Paraschiv et al., 2022). A chatbot is a form of technology utilized in computer-mediated communication, with AI agents increasingly taking on roles that were traditionally performed by humans (Beattie et al., 2020). However, not all chatbots are designed using machine learning or operate as AI-driven systems (Schuetzler et al., 2021). Chatbots are software programs that process natural language as input and generate natural language as output, enabling conversational interactions. Besides facilitating text-based communication, some chatbots also simulate human speech (voice-based chatbots) to enhance user experience and foster customer loyalty. These virtual assistants are commonly integrated into websites, social media platforms, and instant messaging applications. In recent years, research on chatbots has expanded significantly, with scholars and industry professionals exploring ways to enhance their performance, user acceptance, and implementation (Miklosik et al., 2021). Progress in AI, machine learning, data science, and natural language processing has facilitated the development of conversational bots across various applications, enhancing human experiences and driving the rapid expansion of chatbot technology (Kasthuri & Balaji, 2023). Chatbots have been developed for a wide range of purposes, from executing simple commands to functioning as advanced digital assistants and interactive agents (Nguyen et al., 2021).

The retail industry is experiencing a significant transformation driven by rapid technological advancements (Sagio et al., 2025). Technology is reshaping the sector, allowing retailers to adapt to new and unexpected challenges. The role of technology in retail has accelerated notably since the COVID-19 pandemic. Due to lockdown measures aimed at curbing the virus's spread, many retailers were compelled to close physical stores and shift swiftly toward technology-driven solutions, such as online ordering (Shankar et al., 2021). In recent years, chatbots have garnered increasing interest from both researchers and retail professionals. Today, chatbot-related topics are widely discussed in academic studies, leading business technology reports, and global news (Lee et al., 2023). AI chatbots generate human-like responses to inquiries by leveraging natural language processing (NLP) technology to interpret user intent and resolve consumer issues without human intervention. Research on chatbots in consumer behavior has explored perceptions of their human-like qualities and how these attributes impact user acceptance and satisfaction. Previous studies have confirmed that a chatbot with human-like characteristics can influence purchase intentions and lead to favorable product evaluations (Sheehan et al., 2020; Roy & Naidoo, 2021) and identify factors that influence acceptance of chatbots (Pillai & Sivathanu, 2020). Rapid advancements in virtual assistant technology have significantly reshaped customer interactions in online retail. As conversational technologies evolve, online retailers continuously explore innovative methods to engage with customers (Kumar et al., 2024; Madanaguli et al., 2023). The rise of virtual assistants, particularly chatbots and voice bots, has revolutionized customer engagement. With their growing role in the retail sector, researchers (Rohit et al., 2024) have extensively studied the impact of virtual assistants—especially chatbots and voice bots—on consumer shopping behavior. Research on virtual assistant interactions indicates that consumers tend to favor voice-based services over text-based ones, as speech interactions are perceived as more effective than typing (Rohit et al., 2024).

AI and data play a crucial role in driving chatbot development. While AI enables automation of repetitive and routine tasks, chatbots excel in handling such processes, making them valuable tools for enhancing efficiency and user experience. However, when faced with an overwhelming number of incoming requests or overly complex tasks, chatbots may struggle to provide effective responses, resulting in negative outcomes for both businesses and customers (Xu & Zhuang, 2022). Chatbots are unable to adequately address certain issues, especially those that involve complex service problems with numerous variables. Since all chatbots rely on data from various sources, poor data quality can restrict their functionality. Additionally, even with high-quality data, chatbots may still fall short of expectations or fail to deliver optimal results (Liu & Duffy, 2023). The adoption of AI technologies by companies is transforming customer interactions. These technologies have the potential to offer personalized services. In retail and e-commerce, for instance, online stores employ AI chatbots as customer service representatives to provide product information, offer personalized recommendations, and manage order and return requests (Tran et al., 2021).

2. METHOD AND RESULTS

A bibliometric analysis is a quantitative exploratory method that facilitates an objective evaluation of the performance of a scientific field and the overall mapping of scientific knowledge within that field (Mariani et al., 2022). Bibliometrics is a tool for conducting statistical and quantitative analyses of existing publications. In recent years, numerous comprehensive bibliometric studies have been conducted in key scientific fields (Kokol et al., 2021). This study aims to assess the current state of research on chatbots and the significance of technology in the retail sector. Bibliometric analysis involves various analytical elements,

including the total number of citations, authors, sources, and keywords, and offers a thorough examination of bibliographic data essential for a complete literature review (Donthu et al., 2021).

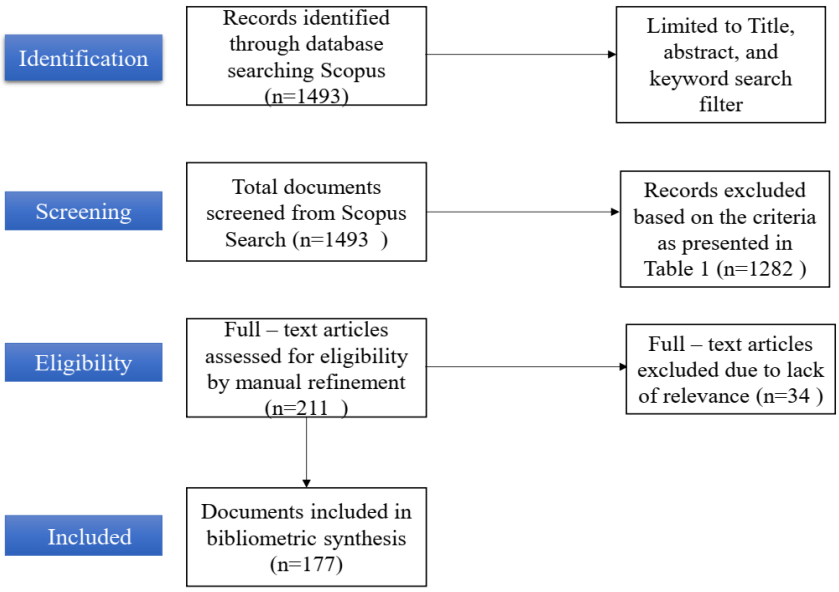

Figure 1. PRISMA flow diagram to identify, screen, and include papers
Source: Author's creation based on Page et al. (2021))

For a bibliometric analysis in artificial intelligence, chatbots, and retail, Elsevier's Scopus database is the go-to source. Its comprehensive index and coverage make it a reliable choice, surpassing the Web of Science (WOS) in this regard. WOS, while valuable, offers limited coverage of articles in social sciences and may not provide a complete overview of past studies on the research topic.

Table 1. The search procedure and inclusion and exclusion criteria

Category	Criteria	No. of refined articles
Search string used on Scopus	TITLE-ABS-KEY((‘artificial intelligence’ AND ‘retail’) OR (‘chatbots’ AND ‘retail’)	1493
Range	Including only articles between 2019 and 2024.	1120
Subject area	Including only articles in the following categories: Business, Management and Accounting (319), Economics, Econometrics and Finance (144), and Social Sciences (134). All the other categories, such as Computer Science, Engineering, or Mathematics, were excluded.	426
Document type	Included only articles.	243
Language	Included only papers in English.	234
Source Type	Included only papers published in Journals	233
Publication stage	Included only papers labeled as Final	211

Source: Authors creation

The initial search was conducted on January 20, 2024, to identify all relevant publications in the Scopus database. The search terms used were: artificial intelligence, chatbots and retail. The search was limited to article titles, abstracts, and keywords. Additional inclusion criteria were applied to refine the results: the date range was set from 2019 to 2024, the document type was restricted to articles, and the language was set to English. The search initially yielded 1493 publications, sorted by more exclusion criteria as detailed in Table 1 - the final list comprised 177 articles.

The selected articles were exported from the database as a comma-separated values (.csv) file containing 211 articles remaining after the initial filtering process. Before analysis, a data cleaning procedure was performed to ensure the accuracy and completeness of the entries. During the cleaning process, the field columns were reviewed to confirm that all necessary fields were included, the contents were properly aligned with the respective field titles, and there were no discrepancies between the article titles and the relevant keywords—artificial intelligence, chatbot, and retail—that were to be analyzed. Based on the second stage of subjective refinement (Bota-Avram, 2023), where all extracted articles were confirmed to be related to business and economics, the final number of papers included in the analysis was 177. More precisely, the final sample included only papers in which artificial intelligence and, or chatbots were discussed in a context that included retail. VOSviewer utilizes two standard weight attributes in its analysis: link and total link strength. The 'link' refers to the number of connections an item has with other items, while 'total link strength' represents the overall strength of these connections (van Eck & Waltman, 2023). For the keyword co-occurrence analysis, a thesaurus file was created and used to eliminate duplicate terms, such as 'AI' and 'artificial intelligence (AI)' which was replaced by the term 'Artificial intelligence', 'chatbot' replaced by 'chatbots', 'e-commerce' with 'electronic commerce' and 'service robot' with 'service robots'. Additionally, Microsoft Excel was used for tables illustrating the trend analysis for publication growth from 2019 to 2024. The first research question examines the publication trends and citation patterns of the 177 articles on artificial intelligence, chatbots, and retail. Table 2 presents the distribution of these articles across the years, along with the total number of citations and the annual growth rate (%) in the number of published articles.

Table 2. Total number of published articles versus total citations

Year	Number of publications	Annual growth rate in published articles (%)	Number of citations based on the articles published
2019	12	0	1045
2020	16	33.33	1343
2021	26	62.50	3026
2022	27	3.85	1144
2023	39	44.44	579
2024	57	46.15	367

Source: Authors creation

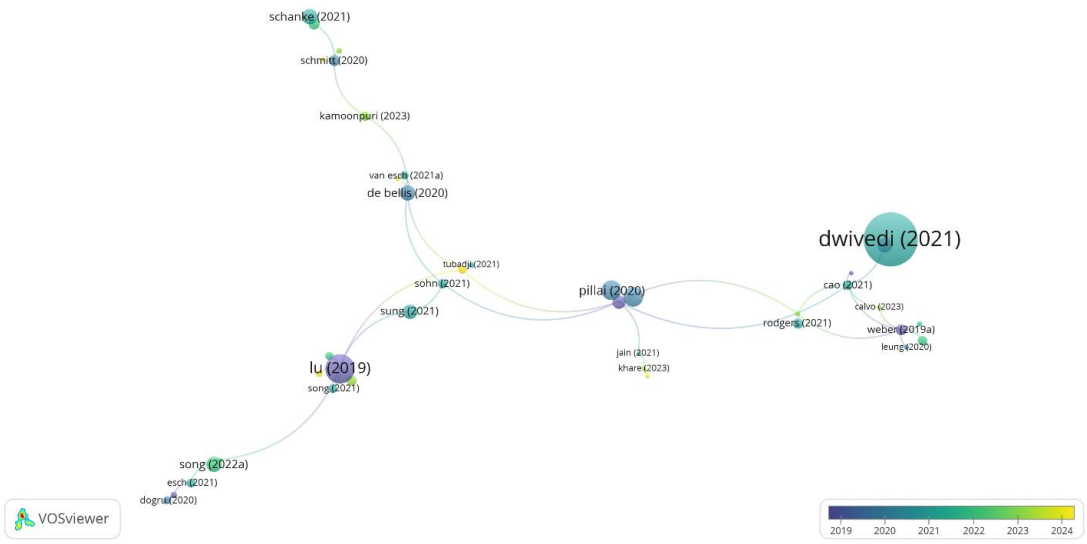

Figure 2. Most cited articles published between 2019 and 2024 (a minimum count of 6 citations)

Source: Authors creation

Figure 2 also illustrates that these most cited articles are interconnected. The co-citation network from the VOSviewer analysis demonstrates how the research field has expanded and evolved. From Lu et al. (2019) evaluating the willingness to integrate AI in consumer interactions to consumer intentions regarding shopping at AI-powered automated retail stores, to research protocols and agendas in the field of AI and to efforts on how to humanize service robots (Song & Kim, 2022).

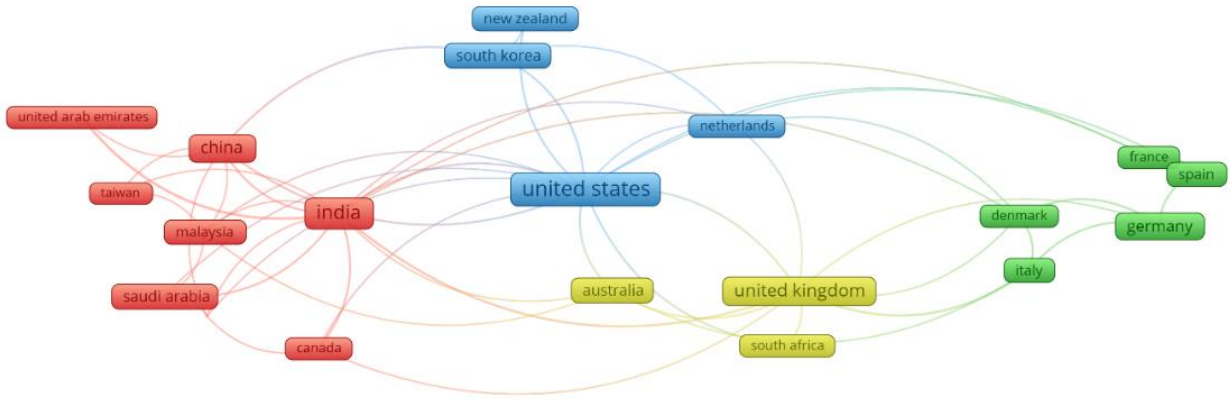

Figure 3. Country co-authorship network based on the articles published between 2019 and 2024 (20 countries with a minimum count of 4 articles out of 177)

Source: Authors creation

The patterns of co-authorship between authors from different countries show four clusters. The biggest is the red cluster containing China, Canada, India, Malaysia, Pakistan, Saudi Arabia, Taiwan, and the United Arab Emirates, with 82 published papers and 3673 citations. The second is the blue cluster: United States, South Korea, Netherlands, and New

Zeeland (total published papers=61, total citations=4534); the third is the yellow cluster: United Kingdom, Australia, and South Africa (total published papers=34, total citations=3924), and the last cluster is green, consisting of Germany, Italy, Denmark, Spain, and France (total published papers=36 papers, total citations=2963).

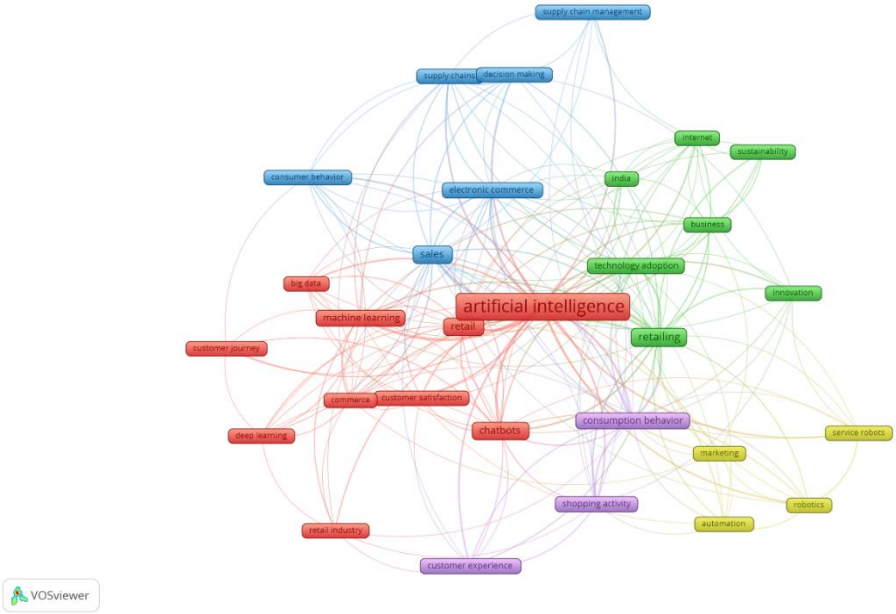

Figure 4. Keywords co-occurrence map based on the articles published between 2019 and 2024

Source: Authors creation

The most significant cluster in red has ten items, starting with artificial intelligence and continuing with big data, chatbots, commerce, customer journey, customer satisfaction, deep learning, machine learning, retail, and retail industry. The second cluster is green and has seven items: business, India, innovation, internet, retailing, sustainability, and technology adoption. The third blue cluster comprises consumer behavior, decision-making, electronic commerce, sales, supply chain management, and supply chains. The fourth cluster, with four items, is yellow and focused on automation, marketing, robotics, and service robots, and the fifth cluster is violet and contains the terms of consumption behavior, customer experience, and shopping activity.

3. CONCLUSIONS

Eastern European countries have cultural and economic characteristics that significantly influence how consumers interact with technology (Rachwal-Mueller & Fedotova, 2024). Trust in artificial intelligence can be lower, expectations regarding brand relationships differ, and the degree of digitalization and technical skills vary considerably from one country to another. In the context of developing countries, digitalization is a strategic priority to reduce economic gaps compared to advanced economies (Malenkov et al., 2021). Retail, being one of the most dynamic sectors, has a key role in this transformation. Technologies such as chatbots can accelerate this process by automating customer relationships, reducing operational costs and increasing efficiency and customer satisfaction. Chatbots operate 24/7, do not involve salary costs, and can be easily integrated into sales platforms, thus representing an affordable and scalable solution for

businesses in the region. When implemented effectively, they contribute significantly to improving the user experience. Therefore, this research is particularly relevant, as it provides valuable insights into a rapidly expanding but still underexplored field in the context of developing countries.

As per our analysis, the topics of artificial intelligence, chatbots, and retail are quite dynamic and the focus of current research. While this analysis only sees the articles indexed in Elsevier's Scopus database, using data from other databases, such as Science Direct, would have provided a different picture regarding the most cited authors. Furthermore, the scope of the study is limited by the language used, the status of the publications, and the years when the materials were published. Also, only journal articles were covered in the analysis. Considering how dynamic the field of artificial intelligence is and how more and more retail companies are including AI in their business models, it is recommended that this research be redone with new data, as this exciting new technology is not without its dark areas. This study provides an overview of the 177 articles available on the Scopus database on January, 2025. The articles were selected using the keywords 'artificial intelligence', 'chatbots,' and 'retail,' forming the basis of a bibliometric analysis.

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