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Bibliometric Analysis of Chatbot and E-commerce Research: Growth, Collaboration, and Key Trends (2017–2024)

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Abstract

This study provides a bibliometric analysis of chatbot and e-commerce research from 2017 to 2024, exploring publication growth, collaboration, and research themes in this expanding area. Analysing 125 documents from Web of Science, it finds an annual growth rate of 47.93%, indicating strong academic interest. International collaboration is prominent, with 26.4% of studies involving co-authors from different countries, primarily led by researchers in China, India, and the United States, and institutions like Hainan University and Columbia University. Key research themes include “e-commerce,” “trust,” “model,” and “artificial intelligence,” pointing to a focus on user trust, AI-driven technologies, and adoption trends in digital commerce. Major journals, including the *Journal of Retailing and Consumer Services* and *Computers in Human Behavior*, have been influential in disseminating findings, supporting a cross-disciplinary approach. The study also highlights the impact of chatbots on customer engagement, personalization, and sales conversions, with emerging concerns about the psychological aspects of AI interaction, such as user trust and acceptance. For future studies, it recommends combining data from multiple sources like Scopus and WoS and using tools like VOSviewer and Biblioshiny to enhance data visualization (Anglada-Tort & Sanfilippo, 2019). This analysis offers valuable insights into the current trends and future directions of chatbots in e-commerce.

Keywords: Bibliometric Analysis, Chatbot, E-commerce, Artificial Intelligence, Customer Service

Introduction

Bibliometric analysis has become an essential tool for understanding the structure, evolution, and impact of research fields, especially in rapidly growing areas like chatbot and e-commerce technologies. One powerful approach to bibliometric analysis is science mapping, which involves several steps and uses various analyses and mapping software tools to visualize and interpret complex relationships among scientific publications. However, performing

comprehensive science mapping can be challenging due to the diversity of methodologies and software involved (Aria & Cuccurullo, 2017). To streamline this process, the open-source *bibliometrix* R-package and its companion app, *Biblioshiny*, offer researchers a structured and accessible workflow for conducting detailed bibliometric analyses.

Bibliometrix supports a recommended science mapping workflow, which is broken down into five key stages: data collection, preprocessing, analysis, visualization, and interpretation. Using data from Clarivate Analytics' Web of Science (WoS), bibliometrix can perform functions like co-citation analysis, keyword co-occurrence mapping, and collaboration network mapping, making it ideal for gaining insights into the structure and trends of specific research domains (Choe, 2023). In this study, bibliometric analysis through Biblioshiny is applied to the fields of chatbots and e-commerce, two interlinked areas experiencing significant growth. Chatbots, or automated conversational agents, are increasingly being used by e-commerce platforms to enhance customer service and user experience. Through bibliometric analysis, this study aims to map the development of chatbot and e-commerce research, identify key trends and influential works, and understand collaborative patterns within these fields. Hence, the use of chatbots in e-commerce represents a significant advancement in how businesses interact with customers. E-commerce, which involves buying and selling goods and services online, has revolutionized global trade by providing convenience, breaking geographical barriers, and fostering competitive markets (Weng et al., 2024). Over the years, this transformation has been further enhanced by tools like chatbots, which help businesses streamline customer service and operational processes. Chatbots, as conversational tools, provide 24/7 support, answer queries, and recommend products, making them valuable assets for e-commerce platforms. Despite these advantages, challenges such as building trust with users, emotional connection, and adapting to cultural differences remain critical areas for further exploration.

The growth of e-commerce and the increasing use of chatbots call for a deeper understanding of their interaction. Studying how chatbots are adopted and their effectiveness is essential to uncover strategies for enhancing their impact (AlWazzan, 2023). For postgraduate students, this area of research is particularly beneficial, as it helps identify gaps in the existing literature, understand the key sources of academic publications, and trace the evolution of research in this field. This knowledge equips students to refine their research focus and contribute to advancing chatbot technologies in e-commerce (Beg et al., 2024).

This study holds significant value for businesses, consumers, and researchers. For businesses, it identifies strategies to optimize chatbot functionality, improving customer satisfaction and operational efficiency. Consumers benefit from insights into how chatbots can enhance their online shopping experiences by addressing issues like trust and adaptability. For researchers and postgraduate students, the study provides a comprehensive view of trends, key works, and potential research opportunities in chatbots and e-commerce (Abdullahi et al., 2024).

By using bibliometric tools like Bibliometrix and Biblioshiny, the study maps the growth, collaboration, and key trends in chatbot and e-commerce research (Ellegaard, 2018). This structured approach not only highlights the evolution of this interdisciplinary field but also bridges academic research with practical applications. Consequently, this work serves as a

valuable resource for advancing knowledge and fostering innovation in the integration of chatbots into e-commerce platforms.

Literature Review

E-commerce, or electronic commerce, refers to the buying and selling of goods and services over the internet, transforming how businesses and consumers interact. Since its inception, e-commerce has grown rapidly, reshaping global retail and service sectors. It allows businesses to reach a broader audience than traditional physical stores, breaking down geographical barriers and offering consumers convenience and a vast range of options. Innovations in payment systems, logistics, and mobile technology have fuelled this growth, enabling seamless transactions and faster delivery services. With e-commerce, customers can shop at any time and compare prices, fostering a competitive landscape that benefits consumers with better prices and diverse products (Laudon & Traver, 2021). The implementation of AI-driven chatbots in e-commerce has emerged as a transformative tool for customer support, enhancing user engagement and operational efficiency across various digital platforms (Prasad, Xavier, & Anute, 2024). These virtual assistants provide 24/7 assistance, answer frequently asked questions, and offer product recommendations, which significantly enriches the shopping experience and drives customer satisfaction (Moriuchi, Landers, & Hair, 2021). Research indicates that chatbots in cross-border e-commerce also help reduce operational costs, although challenges in consumer acceptance and trust remain critical areas of study (Shao & Xing, 2024).

Studies applying the Use and Gratification (U&G) theory reveal that consumers increasingly value chatbots for their convenience and responsiveness, which positively influences their acceptance and usage within online shopping environments (Marjerison, Zhang, & Zheng, 2022). Furthermore, as chatbot-human interactions become more anthropomorphic, elements like trust and emotional connection play vital roles in fostering user engagement and satisfaction (Yang Liu et al., 2023). A 2023 study by Wang et al. applied cognitive appraisal theory, showing that chatbots' emotional responsiveness significantly influences user trust and emotional experiences during shopping interactions.

Research on chatbot language style has demonstrated that tailored language can positively impact customer attitudes toward brands and improve the likelihood of continued chatbot use (Li & Wang, 2023). Additionally, empathy in chatbots can alleviate negative emotions and increase consumer forgiveness after service failures, making service recovery more effective (Guan & Sun, 2023). Empirical evidence supports that chatbots using personalized and sentiment-based responses can improve user engagement and perceived product value (El-Ansari & Beni-Hssane, 2023; Elsholz, Chamberlain, & Kruschwitz, 2019).

Other studies have examined the integration of AI chatbots with other interactive technologies, such as augmented reality, which offers a comparative advantage in delivering an immersive shopping experience (Skrebeca, Kalniete, & Romanovs, 2021). Hossain et al. (2022) emphasize that AI-enabled chatbots are particularly beneficial for small and medium-sized enterprises (SMEs) in e-commerce, as they provide cost-effective alternatives to traditional customer service models, helping businesses scale their services.

Trust mechanisms remain a key area of focus, as research by Li et al. (2023) demonstrates that factors such as chatbot expertise, perceived risk, and privacy concerns heavily influence consumer trust. Similarly, perceived interactivity and humanness in chatbot design can significantly impact user trust and adoption intentions in e-commerce (Ding & Najaf, 2024). Sentiment analysis and machine learning models have further enhanced chatbot personalization, ensuring tailored interactions that foster customer loyalty and trust (Song, Wang, & Chen, 2021).

Moreover, a study by Sundjaja, Utomo, and Colline (2024) on Indonesian e-commerce highlights that continued chatbot use is influenced by customer experience quality and perceived ease of interaction. Another recent review by Madanchian (2024) explores the broader impact of AI on e-commerce, noting that chatbots are central to AI-driven customer acquisition strategies, contributing to increased conversion rates.

Recent advancements in natural language processing (NLP) have allowed for improved chatbot interactions in voice-based e-commerce, with cross-utterance context boosting the accuracy of chatbot responses (Shenoy, Bodapati, & Kirchhoff, 2021). Jin & Eastin (2023) suggest that matching chatbot personalities with user traits may increase product attitudes and customer engagement, highlighting the need for deeper psychological alignment between chatbots and users.

In summary, AI-driven chatbots play an instrumental role in enhancing e-commerce customer service by improving engagement, efficiency, and personalization. However, challenges around consumer trust, privacy, and emotional engagement require further exploration. Future research should focus on integrating adaptive, empathic, and personality-matching capabilities in chatbots to better meet diverse customer needs and enhance long-term user satisfaction.

The evolution of e-commerce has also introduced new challenges and opportunities. Businesses must now navigate issues such as cybersecurity, data privacy, and the need to provide engaging, user-friendly platforms to retain customers in a highly competitive market. Moreover, the rise of social media and mobile commerce has led to new strategies like influencer marketing and social shopping, where users can purchase products directly through social media platforms. As the e-commerce sector grows, it also impacts traditional retail models, with many brick-and-mortar stores shifting to an online or hybrid approach to meet changing consumer demands. The COVID-19 pandemic accelerated e-commerce adoption further, as restrictions pushed both consumers and businesses toward digital transactions (UNCTAD, 2020). As a result, e-commerce has become a crucial part of the global economy, continuously evolving with technological advancements and shifting consumer preferences.

Similarly, Chatbots, or automated conversational agents, are software programs designed to simulate human conversation through text or voice interactions (Alimamy & Kuhail, 2023). They have become increasingly prevalent across various industries, particularly in customer service, as they allow companies to handle a high volume of inquiries efficiently and at any time. By using artificial intelligence and natural language processing, chatbots can provide personalized responses, helping customers find information, complete transactions, or

resolve issues without the need for human intervention. Chatbots have evolved from simple rule-based systems to more advanced AI-driven models, capable of understanding complex queries and learning from interactions to improve over time. This technology offers businesses a cost-effective solution to enhance customer experience by providing instant assistance and reducing wait times, especially in high-demand periods (Hsu & Lin, 2023).

In e-commerce, chatbots play a critical role in transforming customer interactions, creating a more engaging and seamless shopping experience. E-commerce platforms use chatbots for various purposes, including answering product questions, assisting with order tracking, recommending products, and supporting the checkout process. By providing real-time assistance, chatbots help reduce cart abandonment rates and encourage more conversions, making them valuable for revenue generation. They can also gather data on customer preferences and behaviors, enabling more targeted marketing and personalized shopping experiences, which are essential in the highly competitive e-commerce landscape. As chatbot technology continues to improve, its integration with e-commerce is expected to deepen, creating more sophisticated, user-centric platforms that can respond to individual needs effectively (Adam et al., 2021). This leads to the methodology applied in this study in the next section.

Research Methodology

The data for this bibliometric analysis were collected from the Web of Science (WoS) database, chosen for its comprehensive coverage of high-quality scholarly literature. The initial search yielded a total of 245 documents. To ensure the relevance and quality of the data, several inclusion and exclusion criteria were applied. The analysis was limited to peer-reviewed articles and conference papers to maintain a focus on rigorously vetted research. Furthermore, only documents published in English were included to ensure accessibility and consistency in language for analysis.

The search was also restricted to publications from 2017 to 2024 to capture recent trends and developments within the study's scope. Applying these criteria reduced the dataset to 125 documents, which met the established inclusion threshold. This final dataset formed the basis for subsequent bibliometric analyses, allowing for a focused examination of recent research patterns, influential publications, and collaborative networks in the field. The data set collected from WOS were exported to Biblioshiny APP. Using Rstudio, R software with Biblioshiny App and Excel for the analysis and visualization of the dataset as described in the next section. Below is the PRISMA flow diagram show the various stages of identification, screening, eligibility and inclusion.

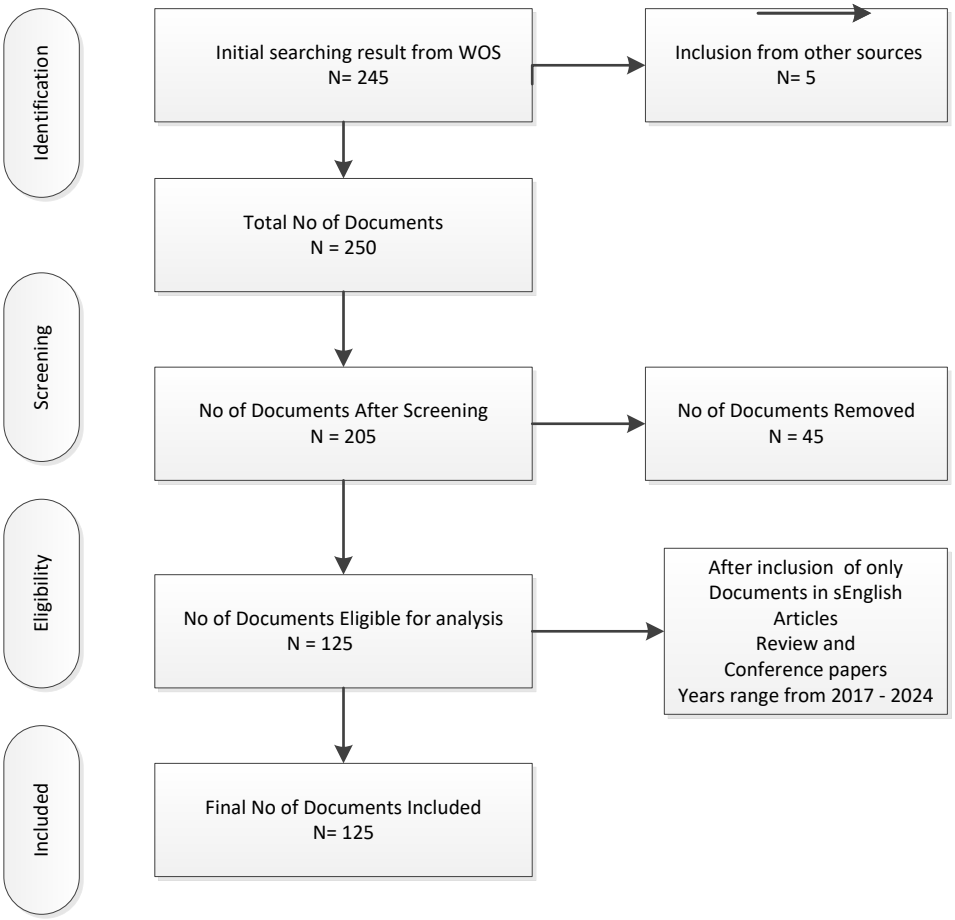

Figure 1. Prisma Diagram of Inclusion and Exclusion of Documents in the Study

Analysis

Main Information About the Data

The bibliometric analysis provides an overview of research data related to Chatbot and e-commerce from 2017 to 2024. During this period, 125 documents were published across 108 different sources, including journals, books, and conference proceedings. The annual growth rate of these publications is notably high at 47.93%, indicating a rapidly expanding field. The average age of the documents is relatively young at 1.9 years, suggesting that research in this area is current and continually evolving. With an average of 25.08 citations per document, the impact of these publications is significant, although the data show that there were no references cited within this analysis.

In terms of content, the dataset includes 260 unique Keywords Plus (ID) and 412 Author's Keywords (DE), which reflect the diversity of topics explored within the chatbot and e-commerce field. The research involved contributions from 402 authors, with only 7 single-authored documents, pointing to a high level of collaboration. On average, each document has 3.47 co-authors, and 26.4% of the documents feature international co-authorship, highlighting the global interest in this research domain. Document types primarily include 65 articles, 10 early-access articles, 41 proceedings papers, and 9 review articles, showing a balance between foundational research, emerging findings, and comprehensive reviews in this field.

Table 1
Main Data Information

Description	Results
Timespan	2017:2024
Sources (Journals, Books, etc)	108
Documents	125
Annual Growth Rate %	47.93
Document Average Age	1.9
Average citations per doc	25.08
References	0
DOCUMENT CONTENTS	
Keywords Plus (ID)	260
Author's Keywords (DE)	412
AUTHORS	
Authors	402
Authors of single-authored docs	7
AUTHORS COLLABORATION	
Single-authored docs	7
Co-Authors per Doc	3.47
International co-authorships %	26.4
DOCUMENT TYPES	
Article	65
Article; early access	10
Proceedings paper	41
Review	9

Article from Most Relevant Countries in Chatbot and E-commerce

The table provides an overview of research contributions from various countries in terms of the number of articles published, single-country publications (SCP), and multiple-country publications (MCP). China leads with 40 articles, representing 32% of the total, with 30 being SCPs and 10 MCPs (25% of China's articles are international collaborations). India follows with 14 articles (11.2%), primarily SCPs, and only one MCP (7.1%). The USA has 11 articles, with a high proportion of international collaborations (45.5% MCP). Germany, Portugal, and the United Kingdom each contribute six articles (4.8% each), with the UK showing a high level of international collaboration (83.3% MCP). Canada and Korea have five and four articles respectively, with a lower MCP percentage. Australia and Malaysia each have three articles, all as single-country publications without any international collaboration.

Table 2
Most Relevant Countries

Country	Articles	Articles %	SCP	MCP	MCP %
CHINA	40	32	30	10	25
INDIA	14	11.2	13	1	7.1
USA	11	8.8	6	5	45.5
GERMANY	6	4.8	4	2	33.3
PORTUGAL	6	4.8	4	2	33.3
UNITED KINGDOM	6	4.8	1	5	83.3
CANADA	5	4	4	1	20
KOREA	4	3.2	3	1	25
AUSTRALIA	3	2.4	3	0	0
MALAYSIA	3	2.4	3	0	0

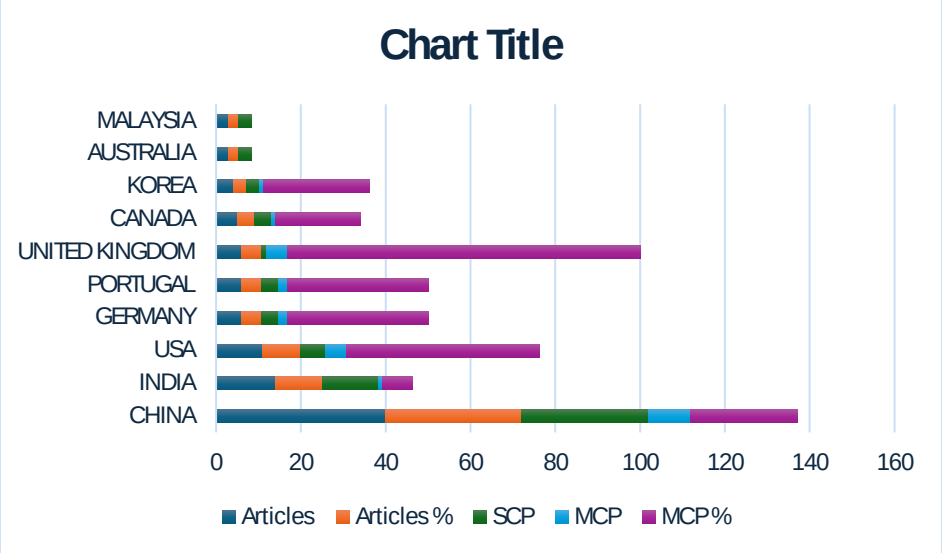

Figure 2. Most Relevant Countries

Most Relevant Source

The list of sources shows the main journals and proceedings that have contributed to research in this field. *Journal of Retailing and Consumer Services* is the most frequently appearing source, with six articles published on the topic. This is followed by *Computers in Human Behavior* and *Electronic Commerce Research*, each with three articles, indicating strong interest in these areas. Other journals and conferences, such as *Australasian Journal of Information Systems*, *Behaviour & Information Technology*, *IEEE Access*, *Information Processing & Management*, *International Journal of Human-Computer Interaction*, and *Internet Research*, each contributed two articles. Additionally, the proceedings from *ECNLP 4: The Fourth Workshop on E-Commerce and NLP* also added two articles, showing a blend of interest from both academic journals and industry-focused conferences. This variety of sources highlights the interdisciplinary nature of research in e-commerce and technology-driven consumer services.

Table 3
Most Relevant Sources

Sources	Articles
JOURNAL OF RETAILING AND CONSUMER SERVICES	6
COMPUTERS IN HUMAN BEHAVIOR	3
ELECTRONIC COMMERCE RESEARCH	3
AUSTRALASIAN JOURNAL OF INFORMATION SYSTEMS	2
BEHAVIOUR & INFORMATION TECHNOLOGY	2
ECNLP 4: THE FOURTH WORKSHOP ON E-COMMERCE AND NLP	2
IEEE ACCESS	2
INFORMATION PROCESSING & MANAGEMENT	2
INTERNATIONAL JOURNAL OF HUMAN-COMPUTER INTERACTION	2
INTERNET RESEARCH	2

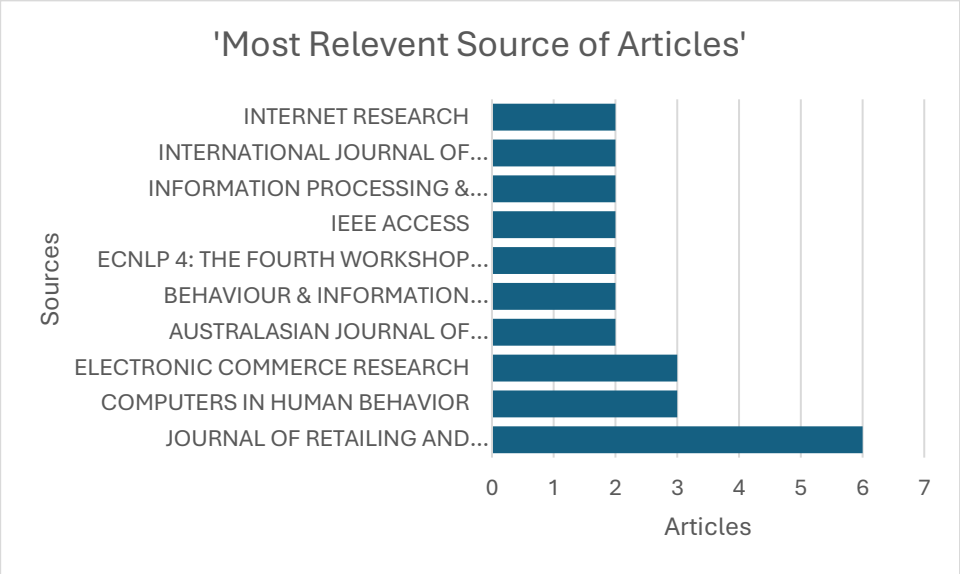

Figure 3 Most Relevant Source

Most Frequently used Words

The table highlights key terms in a bibliometric analysis focused on e-commerce and related fields. "E-commerce" appears most frequently (25), underscoring its centrality, followed by "trust" (15), which is crucial in online interactions. The term "model" (14) indicates the use of frameworks to understand these topics. Both "artificial intelligence" and "impact" (13 each) suggest a strong research interest in the influence of AI on e-commerce, particularly in the adoption of AI-driven tools like chatbots. "Adoption" (12) also reflects a focus on how users embrace these technologies. Other notable terms include "social presence" (11), "acceptance" (10), and "communication" (8), which emphasize the importance of user interaction and communication in digital commerce.

Table 4
Most Frequently used Words

Terms	Frequency
e-commerce	25
Trust	15
Model	14
Artificial-intelligence	13
Impact	13
Adoption	12
Social Presence	11
Acceptance	10
User acceptance	9
Communication	8

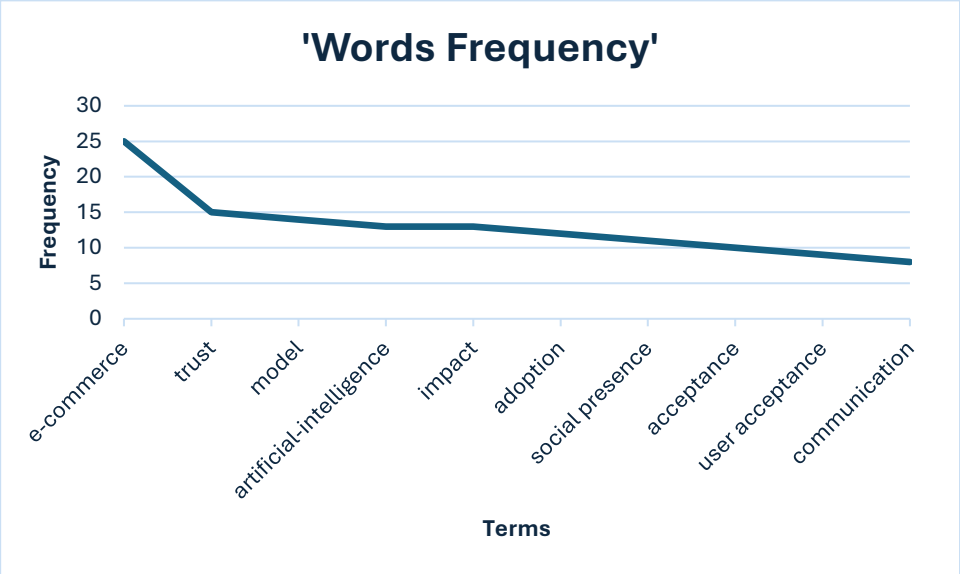

Figure 4 Most Frequently used words

Ten Most Relevant Academic Affiliations

The chart illustrates the most relevant academic affiliations based on the number of articles contributed. Hainan University leads with the highest count, contributing 8 articles, followed by Columbia University with 5 articles. Several institutions, including ICREA, Indian Institute of Management (IIM System), Indian Institute of Technology (IIT) Kharagpur, Indian Institute of Technology System (IIT System), University of Macau, University of New Mexico, University of Texas Austin, and University of Texas System, each contributed 3 articles. This distribution highlights Hainan University's significant research output, with Columbia University also playing a notable role, while the remaining institutions contribute at a similar, lower level.

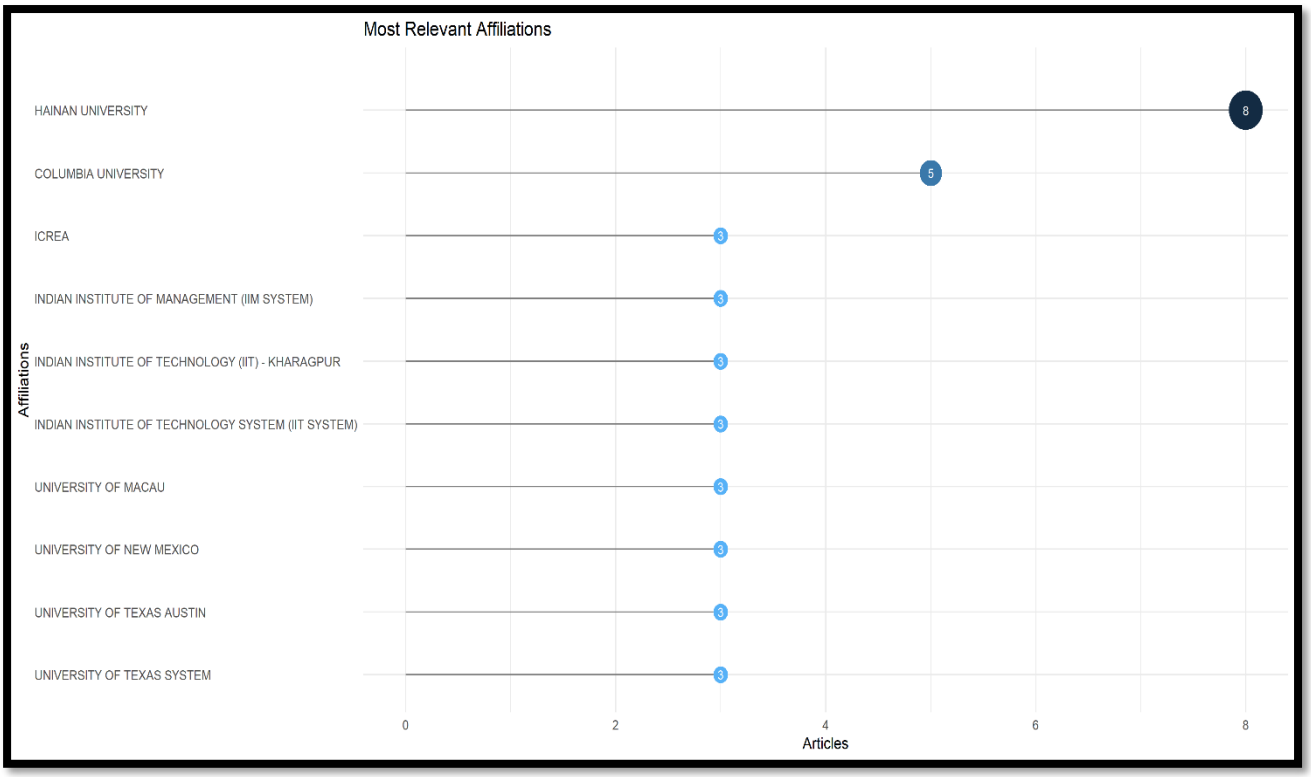

Figure 5. 10 Most Relevant Academic Affiliations

Results and Discussions

Key Findings

The study highlights significant growth in chatbot and e-commerce research, with an annual increase in publications of 47.93% from 2017 to 2024. This rapid expansion underscores the increasing academic and industry interest in understanding and advancing chatbot applications within e-commerce. Research in this area is characterized by high levels of collaboration and international engagement. On average, each publication involved 3.47 co-authors, with 26.4% of works featuring cross-country collaboration. Major contributors to this field include China, India, and the United States, showcasing the global relevance and widespread research activity in chatbot and e-commerce intersections.

Keyword analysis reveals frequently recurring themes like "e-commerce," "trust," "model," and "artificial intelligence," which suggests focused interest on user trust, adoption, and AI-driven models. These themes reflect ongoing efforts to understand and improve the integration of chatbots into e-commerce, particularly as they relate to user experience, personalization, and trust in automated systems. Research is primarily disseminated through leading journals such as Journal of Retailing and Consumer Services, Computers in Human Behavior, and Electronic Commerce Research, with significant contributions from institutions like Hainan University and Columbia University, indicating strong academic investment.

Document types within this research include journal articles, proceedings papers, and review articles, revealing a balance of foundational studies, empirical insights, and comprehensive overviews. China leads in research output, followed closely by India and the United States. The United Kingdom, in particular, shows a high degree of international collaboration, with

83.3% of its publications co-authored with researchers from other countries, reflecting a strong trend of cross-border research efforts.

The analysis also highlights the impact of chatbots on customer experience within e-commerce. Chatbots play a key role in customer engagement by offering instant assistance, reducing cart abandonment, and personalizing user interactions, making them valuable tools for enhancing conversion rates and customer satisfaction. Additionally, emerging research themes focus on AI's influence on e-commerce, user trust in automated systems, and the psychological aspects of interacting with chatbots. These findings indicate a shift toward more sophisticated, human-like chatbot applications designed to meet evolving user expectations in digital commerce, underscoring the potential for further advancements in conversational AI and personalized shopping experiences.

Recommendation

To further advance research in chatbot and e-commerce integration, future studies should explore diverse datasets beyond the Web of Science to incorporate a broader spectrum of academic and industry-driven perspectives. Expanding the scope to include non-English publications could also provide a more comprehensive view of global research efforts. Additionally, focusing on emerging technologies like generative AI, conversational commerce, and cross-platform integrations would enhance understanding of chatbots' role in user experience and conversion rates within e-commerce. Collaboration between academia and industry is also recommended to align research insights with practical applications, ensuring that technological advancements address real-world challenges in customer service, personalization, and data privacy.

Conclusion

This bibliometric analysis reveals a dynamic and growing field at the intersection of chatbot technology and e-commerce. The rapid annual growth rate of publications and high level of international collaboration highlight a globally engaged research community. The findings underscore the importance of chatbots in transforming customer service and enhancing e-commerce experiences through efficient, round-the-clock interactions. Key research trends indicate a focus on AI-driven conversational models, customer trust, and user acceptance, signaling a shift toward personalized, scalable solutions in digital commerce. The analysis also identifies leading countries and institutions contributing to this field, suggesting the global relevance and interdisciplinary nature of chatbot and e-commerce research (Abdullahi et al., 2024). In conclusion, the integration of chatbots into e-commerce represents a dynamic area of study that holds significant value for businesses, consumers, and researchers alike. For new postgraduate students, this field provides ample opportunities to identify research gaps, explore innovative topics, and understand the evolution of chatbot technologies in e-commerce. Additionally, it equips them with insights into key publication sources and collaboration networks, enabling them to effectively contribute to this growing research domain. By leveraging bibliometric tools, students can systematically analyze trends and patterns, guiding their academic focus and fostering impactful studies. Ultimately, this research bridges theoretical advancements and practical applications, laying a strong foundation for future developments in chatbots and e-commerce.

Limitations

The study's reliance on the Web of Science database may have excluded relevant research published in non-indexed journals, potentially limiting the diversity of sources. The timeframe of 2017–2024, while recent, may not fully capture foundational studies in chatbot development. Additionally, language restrictions may have limited the inclusion of significant non-English publications, thus skewing the analysis toward English-speaking regions and institutions. Finally, as bibliometric analysis is inherently retrospective, it may not fully account for rapidly emerging trends or the latest innovations in chatbot and e-commerce technologies. Future studies could address these limitations by including multiple databases, extending the timeframe, and incorporating multilingual datasets.

Future Works

Future research should consider leveraging multiple data sources such as Scopus, Web of Science (WoS), and other relevant databases to create a more comprehensive and diverse dataset. By combining data from these sources, researchers can capture a broader array of publications, including those not indexed in a single database, thus enriching the analysis with a more globally representative view of chatbot and e-commerce research. This approach could also mitigate potential biases that arise from database-specific limitations or language restrictions. Additionally, integrating tools like VOSviewer with Biblioshiny can enhance the depth and visualization of bibliometric analyses. VOSviewer excels in mapping and clustering large datasets, making it possible to conduct co-citation and co-authorship analyses with greater precision and visualization clarity. Using VOSviewer alongside Biblioshiny would allow researchers to create detailed network maps that reveal intricate patterns of collaboration, keyword co-occurrence, and research trends across different disciplines and regions. Such combined use of tools would provide a nuanced understanding of the relationships and influence within the research landscape. Future studies should also explore longitudinal analyses by periodically updating datasets to track the evolution of chatbot and e-commerce research over time. As technologies like AI and chatbots evolve rapidly, maintaining a dynamic dataset and applying both Biblioshiny and VOSviewer to track emerging topics and innovations can offer invaluable insights into shifts in research priorities, collaborative networks, and key areas of growth within e-commerce and AI integration.

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