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Navigating the AI revolution in customer service: a bibliometric analysis

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Abstract

Purpose – With companies' increased adoption of artificial intelligence (AI)-empowered solutions, this study aims to understand the trends in the literature regarding AI in customer service, which is crucial for understanding and finding its long-term viability and future research directions.

Design/methodology/approach – This study adopted a thematic and bibliometric analysis of papers related to the AI revolution and customer service. A total of 804 documents published from 2000 to 2024 were included from the SCOPUS database for the study following the PRISMA framework. A bibliometrix package in R and VOS viewer software was used to conduct a comprehensive analysis.

Findings – The significant findings highlight a meteoric rise in publications related to the integration of AI in customer service, realizing the potential for explosive growth in AI-powered customer service that would redefine customer experience.

Research limitations/implications – Because the database included was only from Scopus and not any other databases such as PubMed or Web of Science, the authors do not claim the list to be exhaustive.

Practical implications – The implications of this study will help policymakers, marketers and researchers comprehend the influence of AI on customer service and consequently anticipate and recommend new options that will enhance overall customer value, service and experience.

Originality/value – To the best of the authors' knowledge, this study is the first to exhaustively review the SCOPUS database and use bibliometric and thematic analysis of the existing literature on AI and customer service. Contributing to the theory and academic understanding, this study provides a robust foundation for exploring and developing innovative AI-driven service frameworks.

Keywords Artificial intelligence, Customer service, Customer experience, Bibliometric analysis, Thematic analysis

Paper type Literature review

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Resumen

Objetivo – Con la creciente adopción de soluciones potenciadas por la inteligencia artificial (IA) por parte de las empresas, el presente estudio tiene como objetivo comprender las tendencias de la literatura respecto al uso de la IA en el servicio al cliente, lo cual es crucial para entender su viabilidad a largo plazo y proponer futuras líneas de investigación.

Diseño/metodología/enfoque – Este estudio adopta un enfoque temático y bibliométrico sobre los artículos relacionados con la revolución de la IA y el servicio al cliente. Se incluyeron 804 documentos publicados entre 2000 y 2024 extraídos de la base de datos SCOPUS, siguiendo el marco PRISMA. Se utilizó el paquete Bibliometrix en R y el software VOSviewer para realizar un análisis integral.

Resultados – Los hallazgos destacan un aumento meteórico en las publicaciones relacionadas con la integración de la IA en el servicio al cliente, demostrando el potencial de un crecimiento explosivo en este ámbito que redefinirá la experiencia del cliente.

Originalidad/valor – Este estudio es el primero en revisar exhaustivamente la base de datos SCOPUS y aplicar un análisis bibliométrico y temático de la literatura existente sobre IA y servicio al cliente. Al contribuir al marco teórico y a la comprensión académica, proporciona una base sólida para explorar y desarrollar marcos de servicio innovadores impulsados por la IA.

Limitaciones de la investigación – Dado que la base de datos utilizada fue únicamente SCOPUS y no otras como PubMed o Web of Science, los autores no pretenden que la lista sea exhaustiva.

Implicaciones prácticas – Las implicaciones de este estudio ayudarán a responsables políticos, profesionales del marketing e investigadores a comprender la influencia de la IA en el servicio al cliente, permitiendo anticipar y recomendar nuevas opciones para mejorar el valor, servicio y experiencia del cliente.

Palabras clave Inteligencia Artificial, Servicio al Cliente, Experiencia del Cliente, Análisis Bibliométrico, Análisis Temático

Tipo de papel Revisión de literatura

客户服务中的人工智能革命：一项文献计量分析研究

摘要

目的 – 随着企业日益采用人工智能 (AI) 赋能的解决方案，当前研究旨在理解有关客户服务中人工智能的文献发展趋势，这对于了解其长期可行性及未来研究方向至关重要。

设计/方法/路径 – 本研究采用主题分析与文献计量分析方法，分析了与人工智能革命和客户服务相关的论文。研究纳入了 2000 年至 2024 年间在 SCOPUS 数据库中发布的 804 篇文献，遵循 PRISMA 框架进行筛选。使用 R 语言中的 Bibliometrix 工具包和 VOSviewer 软件进行了全面分析。

研究结果 – 主要发现强调了有关人工智能与客户服务整合的文献数量激增，显示出人工智能客户服务领域可能实现爆炸式增长的潜力，从而重新定义客户体验。

原创性 – 本研究是首个对 SCOPUS 数据库进行全面审阅，并对现有人工智能与客户服务文献进行文献计量与主题分析的研究。该研究为探索和开发创新型人工智能驱动的服务框架提供了坚实的理论基础，推动了理论发展和学术理解。

研究局限 – 由于所采用的数据来源仅为 SCOPUS 数据库，未包括如 PubMed 或 Web of Science 等其他数据库，作者不对文献的完整性做出保证。

实践意义 – 本研究结果可帮助政策制定者、市场营销人员和研究人员理解人工智能对客户服务的影响，从而预测并提出新的方法，以提升客户整体价值、服务质量和体验。

关键词：人工智能、客户服务、客户体验、文献计量分析、主题分析
文章类型 文献评论

1. Introduction

Artificial intelligence (AI) is becoming a ubiquitous game-changer across all industries and sectors. With the advent of the Big Data revolution, deep learning and most recently, Generative AI, artificial intelligence will remain one of the most powerful tools and create

enduring and impactful change. Its ability to process and analyze mountains of data has opened floodgates for new possibilities. This has helped in facilitating AI algorithms to predict users' behavior and preferences, thus enabling customized solutions that anticipate customer needs (Lakshminarayanan, 2023).

AI's in various services and its ability to reshape industries such as retail, education, transportation, banking and healthcare make it essential to understand how it impacts the thoughts, feelings and actions of customers when they are exposed to AI-enabled frontline service interactions (Ostrom *et al.*, 2019). With technological advances, AI has become a critical capability offering services in every functional area of management such as marketing, HR, technology and operations. Proactive and personalized services through AI will enrich customer experience. This will result in higher customer engagement and greater customer loyalty. It will lead to reduced costs, thereby unlocking significant value for organizations (Das *et al.*, 2023). The meteoric rise of AI's new inflection point, generative technology, which is a more human-centric approach, is attributable to its capability to augment human effort (Victor, 2023).

To understand and compare customers' service preferences in terms of AI vs Humans, Xu *et al.* (2020) defined AI in customer service as "a technology-enabled system for evaluating real-time service scenarios using data collected from digital and physical sources to provide personalized recommendations, alternatives and solutions to customers' inquiries or problems, even very complex ones". Although much research has been conducted on the advances in AI-enabled technology studied by Adiguzel *et al.* (2023), Javaid *et al.* (2023), Masakowski (2020), Soori *et al.* (2023) and Xu *et al.* (2020), little is known about the preferences, experiences and reactions of consumers regarding AI-enabled services (van Esch and Black, 2019). This makes it essential to unravel the capabilities and limitations of AI and disruptive technology in providing better customer services and enhancing customer experience (CX), thereby leading to customer delight.

A bibliometric analysis of publications on customer service chatbots was published in 2023 (Mariciuc, 2023). In that study, the author has reviewed and assessed the use of chatbots in customer services from 2011 to 2022. Mariciuc (2023) bibliometric analysis focused on 318 articles during the ten years under consideration, implying the interest generated in AI and customer service.

With companies' increased adoption of AI-empowered solutions, a thorough examination of the literature's trends for AI in customer service is crucial for understanding and determining its long-term viability. Customers' attitude toward AI and new technologies ranges from excitement to anxiety. The technology adoption rates are different for different customers and are a variant of their technology readiness levels (Chen and Prentice, 2024). There is an ongoing debate regarding whether AI will replace human customer service jobs. Researchers are constantly investigating consumer behavior regarding AI and the human customer service experience (Newstex Trade and Industry Blogs, 2018). Most customer service requests are repetitive and have been previously handled by human agents. This has taken away much of their time and energy and contributed to negative service experiences (McLean and Osei-Frimpong, 2017).

AI in customer service made its humble beginning in the 1950s with the Early AI chatbot, where the initial chatbots were not designed to provide customer service. Instead, they were created as toys to play to test the intelligence of bots. With dramatic changes and technological revolution, AI has spurred revolutionary transformational effects on service organizations (Hollebeek *et al.*, 2021).

There are also concerns and challenges, too, such as linguistic diversity, customer trust and data security (Tad *et al.*, 2023). With AI revolutionizing customer experiences,

Ameen *et al*. (2021) advanced our understanding of the role of trust and perceived sacrifice to enable a better understanding of human interaction with AI-enabled services. Evidence does suggest improvement in efficiency and reduction in labor costs with deployment of AI technologies in businesses (Grewal *et al.*, 2021; Xiao and Kumar, 2019). However, consumers have a negative attitude toward AI in customer service owing to lack of human touch, low degree of personalization and poor intention recognition (Zhao *et al.*, 2022). However, a customer's emotional intelligence and cultural values have a positive impact on intentions to adopt AI services (Rasheed *et al.*, 2023). In their study, Luo *et al.* (2019) extended the discussions about machines versus humans. By conducting a field experiment, their study reveals fewer customer purchases when they are disclosed about the chatbots machine identity. When customers know that the conversational partner is not a human, they not only purchase less but also terminate the calls early as they perceive the disclosed chatbots as less empathetic and knowledgeable. Technology acceptance, quality of chatbot service, perceived risk and perceived brand image are the four critical dimensions in creating user trust toward chatbot services (Alagarsamy and Mehrolia, 2023). Developers must be cognizant of the statutory, regulatory and ethical concerns related to human privacy. Consumers must be treated as protected agents to provide a productive and positive value co-creation environment (Wen *et al*., 2022).

Literature on the persuasiveness of service robots has suggested that the trustworthiness and social acceptance of the robots influence users' decisions (Ghazali *et al.*, 2020). Collaborative customer service of the service robots with store clerks will help strengthen the influence of robots on customers, thereby promoting sales (Okafuji *et al*., 2023). Further advancements in language processing techniques may pave the way for auto-learning chatbots that provide effective and efficient customer and public administration services.

With the evolution of technologies, especially in data analysis, big data, deep learning, powerful hardware and soft-computing techniques, AI has become integral to real life and enhances ease of living (Nirala *et al.*, 2022).These developments have also extended AI adoption in the field of Customer Relationship Management. Yoo *et al*. (2024), in their study emphasized that because the features of CRM differ across CRM functions (sales, marketing, services/support), developers must customize their software to provide user-centric solutions.

A thorough examination of the literature is crucial for understanding the fragmented literature through a sensemaking approach. In the context of bibliometric studies, sensemaking is a powerful tool that allows researchers to move beyond mere data descriptions and develop interpretations. These interpretations offer deeper insights into data's patterns, trends and implications (Lim and Kumar, 2024). This research paper includes all the work (enlisted in Scopus from 2000 to 2024). This would entail significant information and details to help the academic community identify areas to concentrate on and delve into their future research efforts to advance academics. This study provides a detailed overview of the changing professional landscape, global knowledge revolution and advancements in this area of study, which encompasses the service sector.

2. Objectives and research methods

The primary objective of this study is to present a comprehensive review of AI in customer service by applying bibliometric analysis. To our knowledge, bibliometric research is yet to be conducted on the same topic. This study of bibliometric analysis of AI in customer service is the first in the field to examine AI trends and their transformational impacts. Although AI has set a revolution by laying down its strong foundation in customer service and experience, it is yet to reach its fullest potential with various barriers related to its adoption, as mentioned

by Hang and Chen (2022). This study investigates the themes in publications and recognizes prolific scholars, their contributions to the field and the research hotspots (countries and institutions) with maximum work in this area through research and emerging trends in AI in Customer Service.

The research questions focused on identifying the progression of AI in customer service over the years with reference to the number of research publications, themes studied and scientific contributions in the area. The following research objectives (RO) are defined:

RO1. Mapping the bibliometric profile by extracting spatial and geographical trends in publications, the most productive journals and the most cited papers.

RO2. Identifying the most prolific authors publishing in the domain of AI in Customer Service.

RO3. Understanding the most impactful research articles and the top contributing countries and organizations in this research area.

RO4. Determine the trending topics of the past, emergent themes and future research trajectories in research on AI in customer services.

The results of this study are directed at all developments in the field of AI in customer service. Thematic evolution, trend and theme analysis and the trending topics of AI and customer service can stimulate research interest in this field.

Bibliometric analysis has experienced immense growth and popularity owing to its ability to handle large volumes of scientific data and generate a higher research impact (Donthu *et al.*, 2021). Scholars have used bibliometric analysis to unravel emerging trends in article and journal performance and to decipher the accumulated scientific knowledge and evolutionary nuances of AI and its integration with customer service (Sardana, 2023; Verma and Gustafsson, 2020). Furthermore, the bibliometric technique provides a complete assessment of AI in the customer service literature. This strategy helps alleviate interpretation biases that often affect reviews using qualitative methodologies (Agrawal *et al.*, 2023). Compared with other literature view variants, such as thematic reviews, which are essentially performed manually, bibliometric techniques have the advantage of being more objective and elaborative in scope (Kumar *et al.*, 2022; Lim and Kumar, 2024). The following section presents a performance analysis and scientific mapping by providing an overview of the microdetails. To ensure the reliability of the data extraction and screening processes, this study employed the PRISMA framework. All articles were subjected to a rigorous screening procedure, with predefined inclusion and exclusion criteria to eliminate irrelevant documents. While the majority of the screening was automated to reduce human error, manual checks were conducted by multiple researchers at critical stages to ensure accuracy. Regular meetings and cross-checking of decisions were performed to maintain inter-researcher reliability, ensuring consistent application of the criteria across the team.

2.1 Database selection and retrieval

The first step in this technique is to identify and select a database for document retrieval. Although there are several freely available and paid subscription databases such as Google Scholar (GS), PubMed, Web of Science, get CITED and Dimensions, Scopus is believed to be the most reliable database, as stated by Duplančić Leder *et al.* (2023), offering comprehensive coverage of reputed articles (El Baz and Iddik, 2022). We used the Scopus platform by Elsevier, as it allows for the simultaneous export of up to 2000 data points (Arruda *et al.*, 2022). Second, it enables researchers to export data into various file formats

such as CSV, RIS, Plain text (Arora and Mehta, 2023). Third, it is the largest citation and abstract database covering multidisciplinary subjects (Hashem E *et al.*, 2023).

This was followed by a second step that used a string of keywords based on a literature review. An initial search result with the keywords ("Artificial Intelligence" OR "AI") AND ("Customer Service" OR "Customer Assistance" OR "Customer Support) in the Scopus database returned 3,755 document results (as retrieved on May 10, 2024).

The third step is data screening. *Criteria for the study* highlights the inclusion and exclusion criteria and the article curation process following the PRISMA framework, as suggested by Page *et al.* (2021) and shown in Figure 1, to facilitate the development of the flow and structure of the current research:

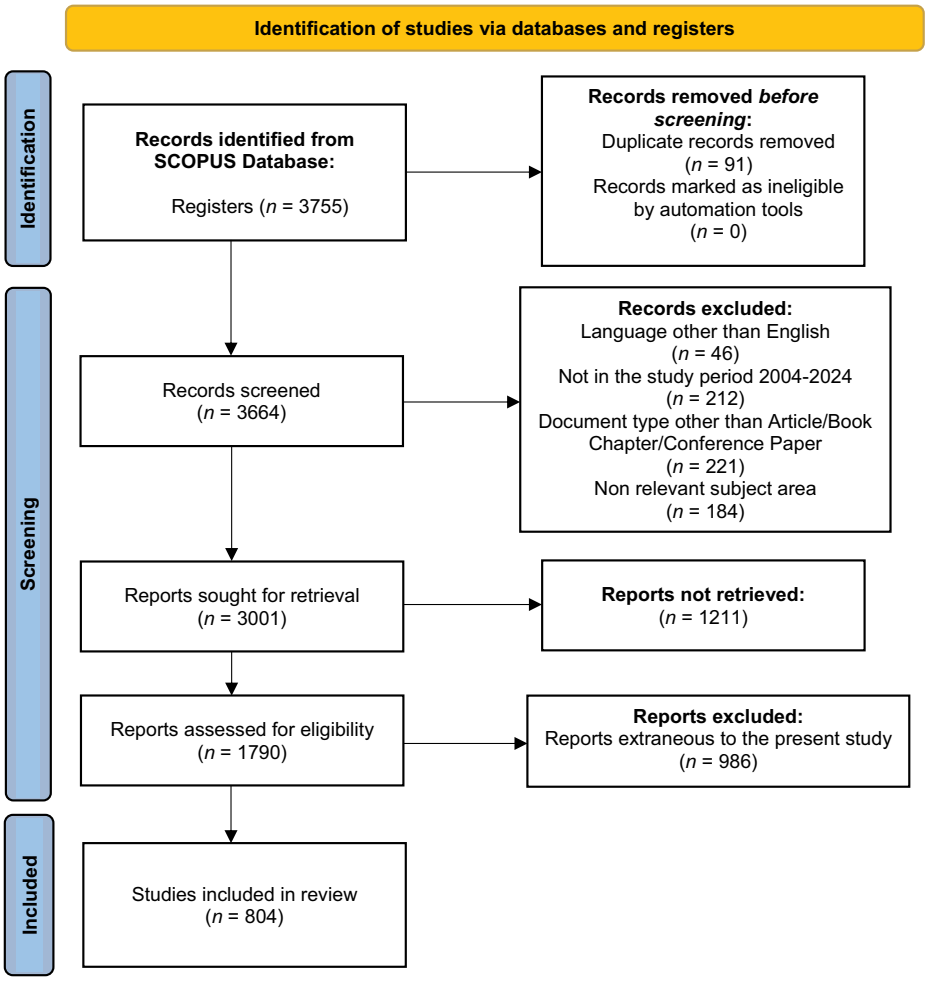

Figure 1. PRISMA framework (Page *et al.*, 2021) of the study

Selection Criteria

(1) Inclusion criteria:
   - Documents available in Scopus Database.
   - Source type of the document is peer-reviewed journal.

(2) Exclusion criteria:
   - Article that did not fit in the study range 2004–2024.
   - Title, Abstract and Keywords did not contain the search term ("Artificial Intelligence" OR "AI") AND –("Customer Service" OR "Customer Assistance" OR "Customer Support).
   - Language of the document published is other than English.
   - The document type other than articles, conference papers and book chapters.

Necessary filtration of irrelevant items was performed, which led to the elimination of 2,951 documents, leaving a sample of 804 documents that were finally included in the bibliometric analysis. For analysis, these data were exported in the CSV file format and then imported into Biblioshiny for Bibliometric application.

2.2 Data analysis

Table 1 presents a summary extracted from the Scopus database for AI in customer services. The database consists of 804 documents published from 2004 to 2024 (May 10, 2024) from

Table 1. Data analysis showing a synthesis of the main information

Description	Results
Main information about data	
Timespan	2004 : 2024
Sources (journals, books, etc.)	381
Documents	804
Annual growth rate %	16.62
Document average age	3.69
Average citations per doc	20.45
References	35,414
Document contents	
Keywords plus (ID)	3,722
Author's keywords (DE)	2,324
Authors	
Authors	2,483
Authors of single-authored docs	55
Authors collaboration	
Single-authored docs	57
Co-authors per doc	3.51
International co-authorships %	30.56
Document types	
Article	555
Book chapter	11
Conference paper	238

381 different sources. The data set consisted of articles ($n = 555$), conference papers ($n = 238$) and book chapters ($n = 11$). The collected papers had an annual growth rate of 16.62%, and the average number of citations per document was 20.45. All sources of AI in customer service have 35,414 references. In addition, the 804 documents on AI in customer service have 3,722 index keywords or keywords plus and 2,324 author keywords. The extracted data included 55 articles written by a single author and 2,483 authors appeared in the multi authored documents. The International collaboration among the authors in this research was 30.56%.

3. Results and discussion

3.1 Growth and volume trend of published studies

Our first analysis focused on the annual publication of articles in the field of AI in customer service over the past 20 years, from 2004 to 2024. An analysis of 804 articles indicated that the knowledge of AI integration in customer service has witnessed a gradual increase in interest in the research community (Figure 2). As evident from Figure 2, research in this domain commenced in 2004, with only three papers published this year. No publications in 2008 and only one in 2010 reflect an unsystematized interest in this field of study. Growth is slow but steady. However, there is vast potential for evolution in this area. AI innovations have evolved at a rapid pace, with multiple iterations and new releases each month. (What is the future of Generative AI? | McKinsey, 2023). Figure 2 also highlights how studies in this domain have seen a steep rise post-2015. Sixty-five articles were published in 2019, reflecting a growth in the interest in the field and a meteoric increase to 156 and 155 publications by 2022 and 2023, respectively. As of May 10, 2024, 65 articles have been published, further substantiating a growing trend. Countries have started realizing the potential for explosive growth in AI-powered Customer Service that would completely redefine customer experience and make room for smoother support interactions. Moreover, deploying AI-driven chatbots with large customer support functions creates a "chat-mosphere" of personalized experience in multiple ways (Newstex Trade and Industry Blogs, 2018). This is a catalyst for persistent growth in this field of study. Figure 2 shows the

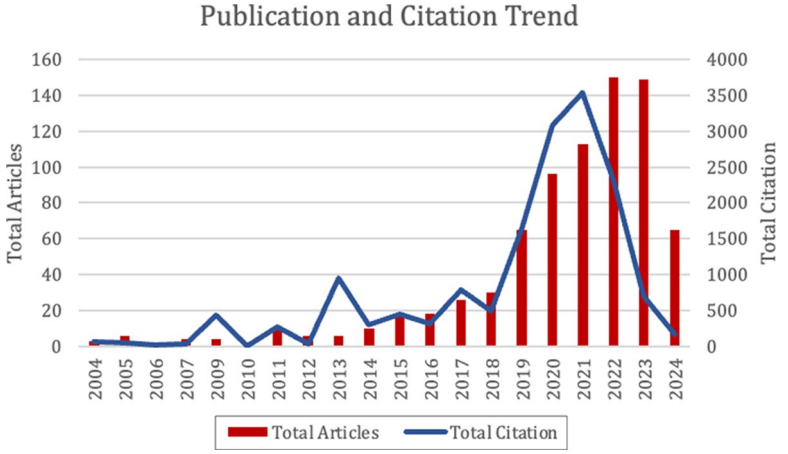

Figure 2. Growth of the research publication and the publication trend over the past 20 years (2000–2024)

average number of citations per year. This outcome highlights the extent of publication's annual impact on the profession. The output revealed a sporadic structure, starting in 2004, when only three publications had 23 citations per article. They garnered an average of 1.1 citations. This was followed by a dispersed and dwindling citation analysis, with average citations falling to 0.54 in 2007, none in 2008 and then again rising to 13.18 in 2013. The authors believed that this irregular trend could be attributed to the dubiosity of customers' reactions to an AI-powered customer service, such as a chatbot or human customer service employee. This could have been a reason for the decline in research interest in the chosen field of study. Although the field of AI has grown explosively, there has always been a dichotomous view of its risks and benefits. According to a research study, 75% of customers value in-person experience, and for them, AI-driven virtual assistants and services make them feel that they are being watched through the web, which might lead to a negative response (Abu Daqar and Smoudy, 2019). Emerging AI technologies such as generative AI, predictive analytics are revolutionizing the customer service experiences. As shown in Figure 2, a gradual increase in the publication trend since 2020 has rekindled researchers' interests. These trends indicate the evolving impact of AI in customer service from early adoption to maturity stages. It is evident that in contemporary times, AI-enabled services will become an integral part of our lives and the number of citations is likely to increase.

3.2 Impactful countries based on citation analysis and publication trends

Table 2 presents the top ten countries that contribute to the topic of AI and customer service based on the total citations of published documents. While the UK tops the list and is the most influential, with the highest number of total Citations, China is the most productive, with 368 documents. This could be attributed to the importance of this field of study, owing to China's vision of becoming the world's main AI innovation center by 2030. The State Council of China 2017 issued "The New Generation Artificial Intelligence Development Plan", which is a blueprint for setting aspirational goals for developing AI technology and applications (Araya and Marber, 2023). With the extensive applications of these technologies to enhance customer service and experience, the academic community in China has focused on technology and the application of AI customer service (Kasinathan *et al.*, 2020).

The authors in the UK have been exploring topics such as Chatbots' effectiveness (Agnihotri and Bhattacharya, 2024), emotional differences between AI and human beings' services (Tubadji and Huang, 2024) and service robots and customer satisfaction (Borghi *et al.*, 2023). According to a study conducted by Albarrán Lozano *et al.* (2021), Spanish people think robots and AI are useful and imperative for innovation, economic growth and enhancing people's quality of life.

Table 2 also highlights the differences in the impact of research between developing and developed countries. The trends subtly reveal the influence of demographic factors such as cultural background, country impact and the acceptance and receptivity to AI-enabled customer services.

Interestingly, while Belgium ranks seventh in terms of total citations, it has the highest average citations per document (ACPD), reflecting its highest impact in relative terms compared to other countries. More than 90% of the research in this field has been conducted in developed countries compared to that in developing countries. The only two developing countries that made it to this Top 10 list are China and India, which rank second and tenth, respectively. These two countries have the lowest ACPD in the table, with China at 3.35 and India at 0.16. The Netherlands, being a developed nation, has an ACPD of 21.81 and ranks second in the list after Belgium.

Table 2. Impactful countries based on citation analysis and publication trends

Rank	Country	*N*	C	ACPD	Type of economy
1	UK	200	2107	10.54	Developed
2	China	368	1231	3.35	Developing
3	Netherlands	48	1047	21.81	Developed
4	USA	197	977	4.96	Developed
5	Germany	115	741	6.44	Developed
6	Spain	86	554	6.44	Developed
7	Sweden	31	487	15.7	Developed
8	Belgium	21	466	22.19	Developed
9	Italy	108	376	3.48	Developed
10	India	238	349	0.16	Developing

Note(s): *N* = number of documents, C = total citations, CPD = citation per document

3.3 Impactful authors

Table 3 shows the top ten authors based on their citation analysis, and their contributions have proven beneficial to researchers and academics. It is essential to consider the author's productivity and impact when evaluating relevance within a particular domain. The authors' productivity is defined as the number of papers published within a given duration (Mukherjee, 2010). This impact is measured by the number of citations received each year. Zhang's contribution to this field has continued since 2007. His contributions are also noteworthy and significant for anyone researching the field and understanding the phenomenon of AI in Customer Service. Casalo, Flavian, Belanche and Schepers received the highest number of citations per year, i.e. 95.6 in 2020.

The h-index measures both the productivity and impact of a researcher's work. It identifies the highest number of papers (h), each receiving at least h citations. The metric

Table 3. Top 10 authors based on citation analysis

Rank	Author's name	N	C	ACPD or citation per document	Country affiliation	Affiliation/institutional units	h-index
1	Carlos Flavián	7	790	112.85	Spain	University of Zaragoza	77
2	Daniel Belanche	7	790	112.85	Spain	University of Zaragoza	39
3	Luis V. Casaló	8	785	98.12	Spain	University of Zaragoza	54
4	Jeroen Schepers	5	662	132.4	The Netherlands	Eindhoven University of Technology	26
5	Parida V.	4	484	121.25	Finland	University of Vaasa	71
6	Xinheng Wang	7	440	62.85	China	Liverpool University	29
7	Jochen Wirtz	5	155	31	Singapore	National University of Singapore	90
8	Zhenuan Zhang	8	142	17.75	China	Harbin Institute of Technology	N.A.
9	Joao Reis	4	118	29.5	Portugal	University of Lusofona	20
10	Xingsen Li	4	115	28.75	China	Guangdong University of Technology	22

Note(s): N = number of documents, C = total citations, CPD = citation per document

reflects consistent contributions and influence within a field and balances quality (citations) with quantity (number of papers).

Carlos Flavian, from Spain, has proven to be the most influential author, with 790 citations and an h-index of 77. Daniel Belanche followed him, with equal citations and an h-index of 39. The third most impactful Author is Luis V. Casalo, with a very close number of citations (785). The most prominent themes discussed in their studies are "artificial intelligence," "services," "machine learning," "customer service" and "chatbots."

Although China topped the list of countries contributing to AI and customer service research, the authors belong to the lower end of the spectrum. This shows that although the country provides substantial research in this field, it needs impactful authors compared to Spain and other European countries.

3.4 Impactful journals

The most relevant sources as impactful journals would benefit the academic community that wishes to study the field and retain their focus on publications to submit manuscripts on AI in Customer Service. From a total of 804 sources, the authors identified the top 10 impactful journals based on performance metrics, namely the h-index, number of documents published, g-index, cite score, Scimago Journal Ranking (SJR) and total citations, as shown in Table 4. The conclusions were reached based on Scopus data gathered in May 2024. The g-index refines the h-index by giving greater weight to highly cited works. This metric

Table 4. Impactful journals based on citation analysis

Sl No.	Sources	h_index	g_index	TC	NOD	PY_Start	ACPD	Cite score 2022	Scopus coverage	SJR (2022)	ABDC listed	Publisher
1	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	13	19	422	50	2004	8.44	2.2	1973 to present	0.32	NA	Springer Nature
2	Sustainability (Switzerland) Multidisciplinary digital publishing institute (MDPI)	13	22	508	25	2018	20.32	5.8	2009 to present	0.66	NA	
3	IEEE Access	11	21	453	25	2016	18.12	9	2013 to present	0.93	NA	IEEE
4	Procedia Computer Science	11	19	399	28	2014	14.25	4	2010 to present	0.51	NA	Elsevier
5	*Journal of Physics: Conference Series*	8	12	177	31	2019	5.7	1	2005 to present	0.18	NA	IOP publishing
6	*Journal of Service Management*	7	9	837	9	2019	93	16.6	2009 to present	2.88	A	Emerald publishing
7	*Journal of Service Research*	6	6	580	6	2020	96.67	17.2	1998 to present	4.99	A*	Sage
	publication	8				Procedia CIRP	6	9	87	13	2013	6.69
3.5	2012 to present	0.58	NA			Elsevier BV						
9	Frontiers in Psychology	5	7	55	8	2021	6.87	4.5	2010 to present	0.89	NA	Frontier media SA
10	*Journal of Business Research*	5	6	599	6	2020	99.83	16	1973 to present	2.89	A	Elsevier

Note(s): TC = total citations, NOD = number of documents, PY = publication year, ACPD = average citation per document

emphasizes the influence of a researcher's most impactful publications, considers the cumulative impact and thus highlights exceptional contributions. Based on its production, it has been established that the most productive and impactful source for information about AI in Customer Service is the Lecture Notes in Computer Science (Including Subseries Lecture Notes in AI and Lecture Notes on Bioinformatics) with 50 publications. It has become the leading journal in this field, with research areas mainly focusing on the publication of new developments in computer science and information technology research. Based on citations, the *Journal of Service Management* by Emerald Publishing, an A-listed Journal, is the most cited with 837 citations, followed by an A* listed journal, the *Journal of Business Research*, which has a total of 599 citations and the highest ACPD of 99.83. A high ACPD indicates that the journal's publications have had a considerable impact relative to those of other journals. The Lecture Notes in Computer Science (Including Subseries Lecture Notes in AI and Lecture Notes on Bioinformatics) and sustainability (Switzerland) had the highest h-index of 13, followed by IEEE Access and Procedia Computer Science, with an h-index of 11. Regarding the prestige of journals (SJR), the most prominent ones are the *Journal of Service Research*, with an SJR of 4.99, followed by the *Journal of Business Research* and the *Journal of Service Management*, with SJRs of 2.89 and 2.88, respectively.

3.5 Impactful articles

Table 5 presents a comprehensive view of the top 10 most impactful articles based on citation analysis. A high global citation rate of articles indicates that the study has a significant scope (Mishra and Dey, 2024). The article New Avenues in Opinion Mining and Sentiment Analysis has the highest number of global citations (878) and throws light on opinion mining and sentiment analysis, which future researchers can use to assess the impact of increased volume of data, advancement in technologies, the wave of AI and its integration with various forms of conversational software agents that facilitate effective customer services. The most impactful articles can also serve as a foundation to explore future theoretical explorations that can facilitate improvement in customer engagement through personalized AI interactions.

3.6 Most relevant affiliations, collaborations and co-authorships

Figure 3 provides an overview of the most relevant affiliations, collaborations and co-authorship. The top ten institutions contributing to the maximum research in the field of study are listed. Indonesia's Bina Nusantara University tops the list with 27 documents, followed by the University of Zaragoza in Spain with 16 papers, closely followed by Beijing University of Posts and Telecommunications and Huazhong University of Science and Technology in China with 13 and 12 documents, respectively. Thus researchers can focus on cross-cultural studies that offer social and cultural implications of AI-adoption in customer service.

3.7 Emergent themes in the research of artificial intelligence in customer service

3.7.1 Keyword occurrence analysis. Keyword Occurrence Analysis of published papers is an essential and pivotal dimension of bibliometric analysis that facilitates an understanding of emerging themes in research, frequently used words and academically trending topics (Khandelwal *et al.*, 2021). Table 6 displays the top 20 keywords that appeared frequently in the 804 papers over the 20 years. It is interesting to note that the academic community has studied topics such as Artificial Intelligence sales under the theme of AI and Customer Satisfaction. The 4th Industrial Revolution encompasses exponential technological advancements and digital transformations backed by AI, presenting a picture of the common

Table 5. Top 10 most impactful articles based on citation analysis

Rank	Title	Author(s)	Journal	Global citations	Average citation per year	Year	Methodology adopted	Study objective
1	New avenues in opinion mining and sentiment analysis	Erik Cambria, Björn Schuller, Yunqing Xia, Catherine Havasi	*IEEE Intelligent Systems*	878	73.17	2013	Review	Discusses the emerging fields of opinion mining and sentiment analysis as tools to process the vast, unstructured information about public opinion on world wide web
2	Technological disruptions in services: lessons from tourism and hospitality	Dimitrios Buhalis, Tracy Harwood, Vanja Bogicevic, Giampaolo Viglia, Srikanth Beldona, Charles Hofacker	*Journal of Service Management*	396	66	2019	Review	Studies how technology disruptions are transforming the ecosystems with examples from the tourism and hospitality sector
3	Real-time co-creation and nowness service: lessons from tourism and hospitality	Dimitrios Buhalis, Yanyan Sinarta	*Journal of Travel and Tourism Marketing*	378	63	2019	Qualitative	Explores how brands in tourism and hospitality use technology to offer real time customer service that enhances customer engagement
4	Handling class imbalance in customer churn prediction	Jeroen Burez, Dirk Van den Poel	*Expert systems with applications*	378	23.63	2009	Quantitative	The study focuses on handling class imbalance in customer churn prediction to enhance customer relationship management
5	Engaged to a robot? The role of AI in service	Ming-Hui Huang, Roland T. Rust	*Journal of Service Research*	372	93	2021	Conceptual	The paper develops a strategic framework for using AI in customer service
6	AI-based chatbots in customer service and their effects on user compliance	Martin Adam, Michael Wessel, Alexander Benlian	*Electronic Markets: The International Journal of Networked Business*	343	85.75	2021	Quantitative	With AI and technological advancements, and replacement of human chat service agents with conversational software agents such as chatbots, the study examines user-compliance and the effect of chatbots in customer service
7	Service robot implementation: a theoretical framework and research agenda	Daniel Belanche, Luis V. Casaló, Carlos Flavián, Jeroen Schepers	*The service industries journal*	330	66	2020	Conceptual and review	The study provides a framework integrating service robots and how they can enhance customer satisfaction and loyalty
8	Survey of review spam detection using machine learning techniques	Michael Crawford, Taghi M. Khoshgoftaar, Joseph D. Prusa, Aaron N. Richter and Hamzah Al Najada	*Journal of Big Data*	317	31.7	2015	Conceptual	The paper studies the effects of big data analytics with an aim to review spam detection to ensure online reviews of customers are truthful and trustworthy
9	Consumers and artificial intelligence: an experiential perspective	Stefano Puntoni, Rebecca Walker Reczek, Markus Giesler, Simona Botti	*Journal of Marketing*	310	77.5	2021	Conceptual	The study examines the social and individual challenges and the costs that consumers experience, in their interactions with AI
10	An agile co-creation for digital servitization: a micro-service innovation approach	Daniel Sjödin, Valtteri Parida, Mikko Kohtamäki, Joakim Wincent	*Journal of Business Research*	283	56.6	2020	Qualitative	The study examines how firms can co-create digital service innovations with their customers by overcoming the digitalization paradox and reaping advantages of digital servitization

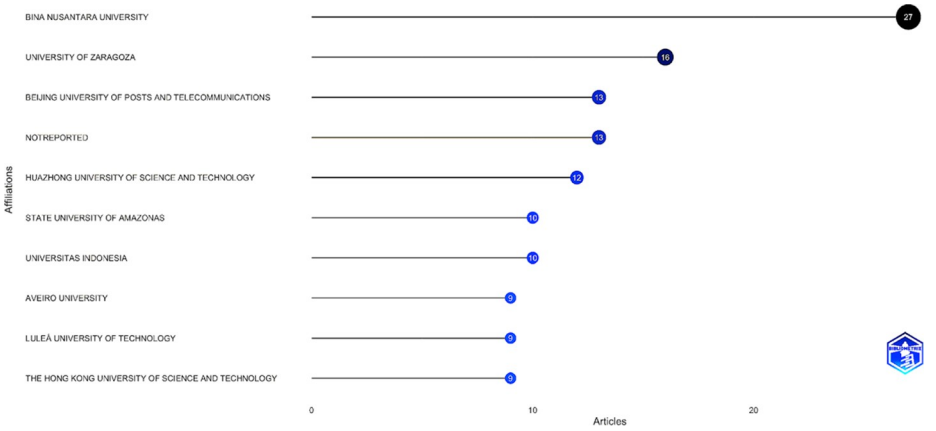

Figure 3. Most relevant affiliations

Table 6. Top 20 most frequently occurring keywords

Rank	Keyword	No. of occurrences
1	Artificial intelligence	360
2	Sales	120
3	Learning systems	62
4	Customer satisfaction	49
5	Decision support systems	44
6	Decision making	35
7	Customer services	32
8	Learning algorithms	32
9	Chatbots	30
10	Data mining	30
11	Internet of Things	29
12	Electronic commerce	27
13	Machine learning	26
14	Sentiment analysis	26
15	Commerce	25
16	Information management	25
17	Big data	24
18	Customer service	23
19	Machine learning	22
20	Classification (of information)	21

man that machines can also act like humans. Integrating AI in sales has been instrumental in creating significant insights and aiding organizations in making informed and well-thought-out decisions (Computer, 2023). With the emergence of more advanced AI-enabled learning systems that are highly adaptive and personalized, they have gained traction among researchers. Technologies, such as virtual reality (du Boulay, 2019) and intelligent tutoring systems (Guan *et al.*, 2020) reflect the potential use of AI to improve existing learning systems. AI has been considered a boon to customers and firms in the B2B and B2C

domains with the advantages of tools such as chatbots, conversational AI and speech and image recognition technologies that help map the critical points in the customer's journey (Grewal *et al.*, 2021). By fostering a culture of automation and innovation, enhanced market effectiveness and efficiency can help improve the user experience (Dhiman *et al.*, 2023), leading to customer satisfaction. The growing importance of identifying pain points in a customer's journey with the help of AI helps to deliver Customer Value. Hence, a deeper understanding of the influence of AI on customer service will help marketers and researchers anticipate and recommend new options that will enhance overall customer service and experience. With easy access to AI-driven big data, the Internet of Things and data storage have dramatically changed entrepreneurial decision making by realizing the full potential of AI-driven big data (Knieps, 2023).

However, keyword analysis alone is insufficient for understanding the current intellectual structure and its relationships in detail (Kulakli and Arikan, 2023). To understand more about the field, the study looked at the data visualization and keyword co-occurrence network trends using the VOS viewer software (Li *et al.*, 2020). The frequency of keyword co-occurrence has been accepted as a reliable indicator that ensures a strong link and relationship among publications, thus allowing the researcher to identify emerging and valuable themes within the subject domain (Khasseh *et al.*, 2017; Malacina and Teplov, 2022; Mohammed *et al.*, 2015).

Figure 4 shows a temporal overlap visualization map of keyword co-occurrence in the literature on AI in customer satisfaction. Yellow represents the emerging topics in the domain. With the popularity of AI and its role as a game changer, research focusing on topics related to digitization, chatbots and customer satisfaction has evolved. The COVID-19 pandemic has accelerated a decade's worth of innovation in just a few short months with AI playing a pivotal role in creating new experiences (Broadcast and CableSat, 2021). With the

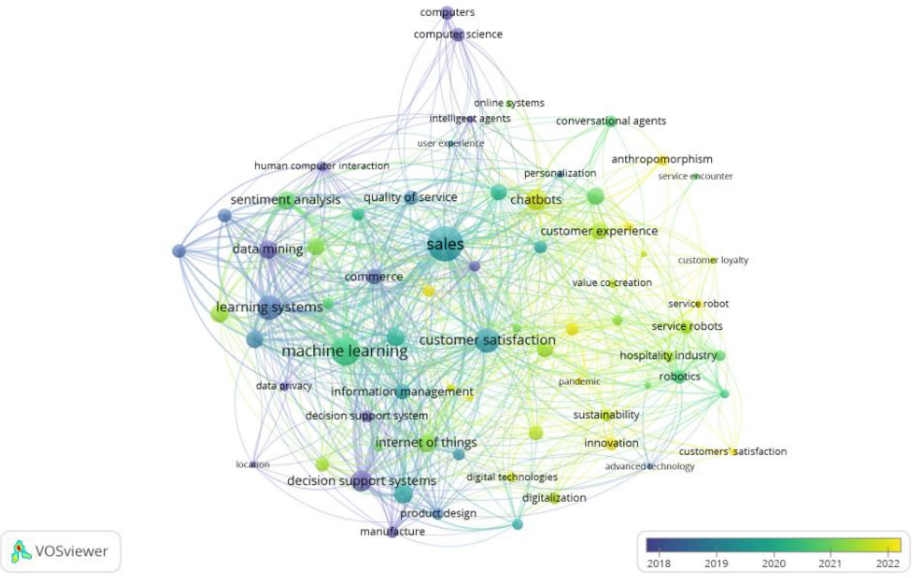

Figure 4. Temporal overlay visualization map on keyword co-occurrence for the literature

growing importance of customer experience post-pandemic, retailers have been focusing on hyper-personalization (Rai, 2022). Most of the research has focused on topics pertaining to user chatbot conversations (Chin *et al.*, 2023) modeling chatbot adoption for online shopping (Said *et al.*, 2022), the use of artificial intelligence technology for sustainable consumption behavior (Wen *et al.*, 2023) and the empowering impact of AI in the hospitality industry (Sanghi, 2022). These emerging topics have a great deal of scope for future research and can be explored by scholars working in the research field of AI and customer service. They can further provide impetus to understand the managerial strategies for customizing the bots in a manner that it aligns with customer preferences and interests. The figure also depicts a network of topics through various nodes. This network exhibits the prevalence of relationships between them, which has been discussed in cluster analysis and the scope of future research.

3.7.2 Cluster and co-citation analysis. Co-citation analysis is often used to identify thematic literature evolution and emerging themes that help to identify clusters and their interrelationships from cited references (Sardana, 2023). Co-citation analysis examines how often two documents are cited together by other works. It maps relationships between publications and fields of study. Co-citation is frequently used to explore the structure of academic disciplines. It helps to identify past trajectories in the field of AI in Customer service and its evolution over a period (Bernatović *et al.*, 2022). The authors identified various clusters of AI in customer services by using the co-citation method. Figure 5 shows the various nodes that are representative of cited references, where the size of the node is indicative of the number of documents in which the article has been co-cited. Out of 35,097, 73 references meet the criteria of a minimum of five citations. Four emerging themes were identified in these clusters. Through visualization and interpretation, we tried to discuss the

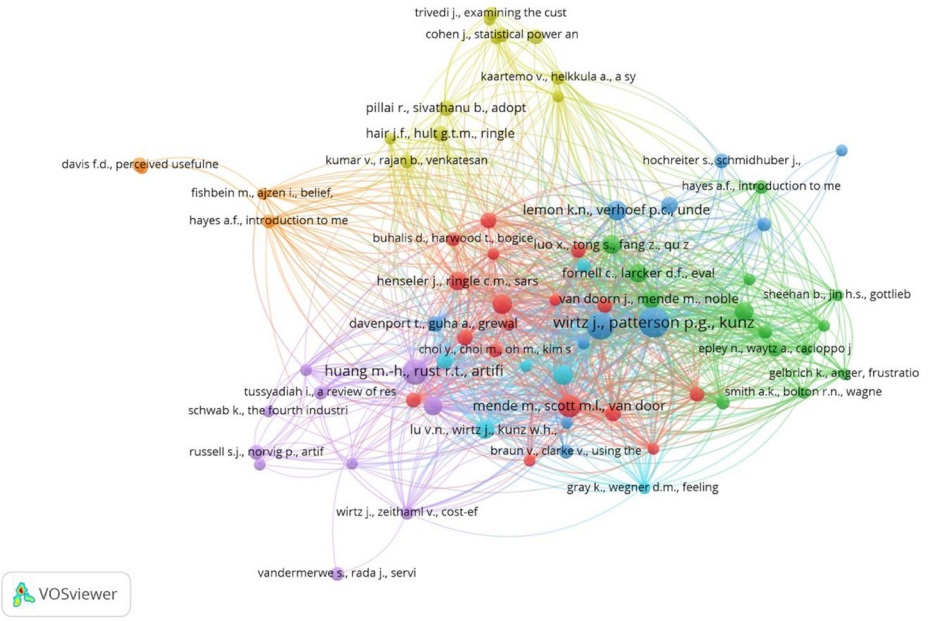

Figure 5. Co-citation network based on cited references with a minimum five citations

nuances of each cluster, giving them a thematic label that paved the way for identifying emerging trends in the field of study.

3.7.2.1 Cluster 1: computerization and service robots in value co-creation. Cluster 1 (red cluster in Figure 5) is one of the most significant clusters, and includes several studies on technological advancements, such as the internet of technology and computerization and their impact on service management (Buhalis *et al.*, 2019; Gursoy *et al.*, 2019; Tussyadiah and Park, 2018). Service robots and their role in value co-creation have been the primary focus of these studies (Choi *et al.*, 2020; Mende *et al.*, 2019; Čaić *et al.*, 2018). Based on the citations, links and link strengths suggested by Bernatović *et al.* (2022), the most significant articles were (De Keyser *et al.*, 2019; Mende *et al.*, 2019; Čaić *et al.*, 2018) which explored the consequences of service robots, how humans respond to humanoid service robots (HSR), and the impact of technology on customer service experiences. Mende *et al.* (2019) discussed various managerial guidelines while deploying HSRs and highlighted that anthropomorphizing HSRs creates discomfort for humans, thus leading to compensatory consumption. Anthropomorphism refers to a product's ability to have a human appearance that includes both psychological and non-psychological features. Lu *et al.* (2019) and Čaić *et al.* (2018) considered the perspective of elderly informants regarding socially assistive robots in elderly care. It explores the roles of these service robots in value co-creation and co-destruction, and highlights the impact of these human-like traits in these service robots that offer value propositions. With referenced documents emerging as early as 1990, the cluster included documents focusing on tourism and hospitality businesses. Parasuraman and Colby (2014) developed an updated version of the Technology Readiness Index (TRI 2.0), which measures customers' readiness to embrace ever-changing technology and its utility as an effective tool for customer segmentation.

Emerging themes and future research avenues: *Studies on consumer experience of Machine Robots vs Anthropomorphic robots;* because various studies have presented divergent views and findings about the impact of anthropomorphizing service robots vs machine robots on consumer behavior, it would be beneficial to study the experience of consumers in these two categories further. Understanding the collaboration and competition between the two and how their deployment can be tailored to align with customer preferences and demographics shall be pivotal in alleviating customer discomfort and improving customer engagement.

3.7.2.2 Cluster 2: antecedents and consequences of the conservational software agents. In Cluster 2 (green cluster in Figure 5), the articles predominantly discuss the antecedents and consequences of the conservational software agents (CAs), that is chatbots and their encounters with customers. These articles have discussed various antecedents, such as the personality of the users (Shumanov and Johnson, 2021), consumer's emotional state (Crolic *et al.*, 2022), the psychological aspects of anthropomorphism and the potential consequences of customer satisfaction or dissatisfaction in service encounters. The most cited article in Cluster 2 was by Araujo (2018), who highlighted embodied and disembodied conversational agents. This study explores the pervasive presence of disembodied CAs on social media and messenger apps and their impact on customer satisfaction during service encounters. The articles in this cluster have psychology as a core theoretical background, investigating the effect of CSAs on consumers' attitudes, motivations, emotions and expectations and how these experiences further impact their purchase intentions and attitudes toward the company (Luo *et al.*, 2019). An interesting insight by Sheehan *et al.* (2020) on human–chatbot interaction was to test anthropomorphism by observing the differences between an error-free/perfect chatbot, which seeks clarification, and an error one. The study concludes that resolved errors or clarifications enhance anthropomorphism and adoption intention.

Shumanov and Johnson (2021) suggested the manipulation of the chatbots using the response language in a way that will be mutually beneficial for consumers and the company, as it matches the consumers' personalities, who could either be introverts or extraverts.

Emerging themes and future research avenues: *Impact of* AI *in different service sectors;* while many studies have explored the impact of AI in customer service with particular emphasis on the tourism and hospitality sectors, different service sectors such as supply chain and logistics, banking, airline and retail stores should be explored as each of these sectors is varied in terms of the amount of customer-employee interaction. Therefore, researchers should investigate the impact of AI on other stakeholders. Studying these unexplored industries can facilitate in enhancing customer support and provide managerial strategies for the deployment of these CSAs.

3.7.2.3 Cluster 3: smart technologies and frontline services. In Cluster 3, the articles primarily dealt with Frontline Interactions, ever-evolving smart technologies and growing consumer expectations for effective and efficient services. According to Kaartemo and Helkkula (2018), since 2010 there has been a surge in studies on consumer interaction and frontline technologies. When complemented by human efforts/frontline employees (FLEs), smart technologies result in more intelligent interactions, leading to service efficiency and effectiveness (Marinova *et al*., 2016). The most cited article in this cluster (Wirtz *et al*., 2018) highlights the key differences between service employees and service robots by explaining the distinctions between professional service roles and subordinate service roles (SSR), and that robots are preferred over FLEs in service delivery for SSRs. It suggests a service robot acceptance model that explains different levels of analytical intelligence, including mechanical, analytical, intuitive and empathetic, and that consumer acceptance is a function of how effectively these smart technologies will deliver on four levels. Huang and Rust (2018) discussed the ramifications of the four levels of the replacement of human service labor on similar lines. Using an interdisciplinary approach, Davenport *et al.* (2020) proposed a framework of three dimensions that facilitates understanding the evolution of AI and advocates integration between service providers and beneficiaries for the utmost effectiveness.

Emerging themes and future research avenues: *Societal and ethical implications of* AI *and customer service;* with the categorization of different levels of intelligence and AI involving pre-programmed algorithms (Kaartemo and Helkkula, 2018), future research studies can focus on the security of smart technology and ethical considerations regarding these service robots so that they offer the maximum utility to stakeholders. Future researchers could also explore the factors that could drive the success or failure of any integration between service providers and beneficiaries. Data privacy, transparency and guidelines for ethical AI-deployment to ease out the complex and dynamic decision making process can be explored. This would provide a framework for ethical and security concerns. Studies should not only focus on the impact at a generic level, but also at a macro level that focuses on the ethical and societal implications that govern the behavior and decision-making of various stakeholders.

3.7.2.4 Cluster 4: customer engagement and user acceptance. This cluster predominantly deals with articles on AI-enabled customer experience, user acceptance and customer engagement. Ameen *et al.* (2021) in their study highlighted the pivotal roles of trust and perceived sacrifice. When an AI-enabled customer experience offers convenience, service quality and personalization, brand trust is enhanced. Consumers perceive sacrifice as less of a problem, eventually improving their engagement and shopping experiences. Predictors of AI-based chatbots involving parameters such as trust and convenience, and their effect on user acceptance have been explored (Kumar *et al*., 2019). Smart, user-friendly

and emotionally intelligent technologies are likely to reduce technological anxiety and increase user readiness to accept it (Prentice and Nguyen, 2020). One of the first documents emerging in 1988, Vandermerwe and Rada (1988) introduced the concept of "servitization of business" and its role in adding value to businesses. Chung *et al*. (2020) found that e-service agents offer a positive brand experience to customers in luxury fashion and again emphasize personalization, quality and convenience as factors of paramount importance.

Emerging themes and future research avenues: *Role of personality in machine-human interaction;* given the ubiquitous deployment of chatbots in customer service, more studies exploring the importance of personality in machine–human interaction can be addressed. While humans are likely to interact with matching personality types (Byrne, 1997), the same needs to be explored in the case of human-bot interaction, as it will help increase utility for both users and organizations (Matz *et al.*, 2017). Further empirical research is needed to explore how experience, satisfaction and engagement can be defined in terms of AI in customer service. It is important to integrate psychology, marketing and AI to explore individual preferences for different types of bots and examine their role in transforming customer service experiences. Variables such as trust, attitude, concern can be explored to understand the complementary and dynamic relationship between humans and bots. Future studies can also focus on variations, if any, owing to gender differences, cross-national contexts and other demographic factors in the responses and experiences of consumers regarding smart technologies in frontline services.

4. Conclusion

This study is the first to examine AI trends and their transformational impacts on customer service through a bibliometric lens. It identifies key publication trends, emerging themes and future research agendas, offering a structured synthesis of the existing dispersed knowledge. As AI continues to redefine customer service paradigms, the findings underscore the importance of ethical considerations, demographic insights and multidisciplinary approaches in advancing the field. Effective implementation strategies for service robots and conversational agents are critical for industries like retail, hospitality and healthcare. Managers can enhance customer interactions by tailoring the personality traits of AI to align with customer demographics and preferences while mitigating discomfort caused by overly human-like features in humanoid robots. Personalized AI interactions, enabled by real-time sentiment analysis, can dynamically adapt service responses, fostering deeper customer engagement. Furthermore, ethical and security frameworks must guide AI deployment, ensuring transparency, data privacy and the mitigation of biases in decision-making algorithms. For underexplored sectors such as supply chain, logistics and airlines, actionable strategies include automating order tracking and enhancing time-sensitive customer support. Future research should integrate psychology, marketing and AI to better understand human-bot interaction, trust-building and personality alignment. Methodologically, co-citation analysis highlights the evolution of AI themes in customer service, offering a roadmap for similar bibliometric studies in other emerging domains. In addition, investigating societal and cultural implications of AI adoption across global contexts can yield valuable insights into cross-cultural nuances. Bridging existing gaps in the literature requires exploring the effects of AI on marginalized demographics and less-studied sectors. The avenues for future research include examining cross-industry and cross-cultural differences in AI's impact on customer service in sectors like banking, retail and logistics. Understanding human-bot interaction dynamics, particularly how personality traits influence preferences for anthropomorphic versus machine-like bots, is essential. Longitudinal studies could provide insights into the evolving impact of AI on customer satisfaction and loyalty. Investigating the

ethical and security dimensions of AI, such as data privacy and algorithmic bias, remains critical. The potential for AI-augmented workforce collaboration merits exploration, with a focus on hybrid service models where AI complements human roles. Research should also address technology readiness and adoption by developing models that account for variables like technological anxiety, perceived utility and trust. Emerging technologies, including generative AI, real-time voice assistants and predictive analytics, warrant examination for their transformative role in customer service. This study underscores AI's transformative potential in redefining customer service paradigms while providing actionable insights and laying a robust foundation for future scholarly inquiries. Addressing limitations, such as reliance on the Scopus database, can enhance the comprehensiveness of future studies and further solidify the field's academic foundation.

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