

Adoption of service robots: exploring the emerging trends through the lens of bibliometric analysis

Adoption of
service robots

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Abstract

Purpose – The aim of this study is to examine the existing literature on service robots in order to identify prominent themes, assess the present state of service robotics research and highlight the contributions of seminal publications in the business, management and hospitality domain.

Design/methodology/approach – This study analysed 332 Scopus papers from 1985 to 2022 using bibliometric techniques like citation and co-citation analysis.

Findings – The study findings highlighted that there has been a consistent rise in publications related to service robots. The paper identifies three significant themes in the service robot literature: adoption of service robots in the context of customer service, anthropomorphism and integration of artificial intelligence in robotic service. Furthermore, this study highlights prominent authors, journals, institutions and countries associated with research on service robots and discusses the future research opportunities in this domain.

Originality/value – This study contributes to the service robots' literature in the hospitality context by compilation of various reference materials using a comprehensive bibliometric analysis. Previous studies do not point out crucial themes in this area, nor do they provide an overview of prominent journals, institutions, authors and trends in this field. Therefore, this study attempts to fill the lacunae.

Keywords Service robots, Bibliometric analysis, Customer service, Anthropomorphism, Artificial intelligence

Paper type Literature review

1. Introduction

Artificial intelligence (AI) powered customer service robots are becoming popular and are predicted to substitute or supplement services that are usually provided by humans in many fields (Song, Xing, Duan, Cohen, & Mou, 2022; Yoganathan, Osburg, Kunz, & Toporowski, 2021) including, hospitality and tourism services. Customers have become more risk-averse because of the pandemic, which has spurred the use of service robots in the hospitality

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industry. A recent projection showed that from 2020 to 2024, the market for hotel service robots will grow by \$942 million. AI-powered customer service robots will help the organisation to reduce the interpersonal contact, diminish the risk of infectious transmission and improve the likelihood of a visit (Wan, Chan, & Luo, 2020). Therefore, restaurants, hotels and airports have begun using service robots to conduct activities such as bringing food and beverages to guests and processing their payments. As a result, consumers prefer robot-staffed (as opposed to human-staffed) service more than ever before (Kim, Kim, Badu-Baiden, & Giroux, 2021; Shin & Kang, 2020). Customer service robots aid organisations by decreasing costs, boosting productivity (Wirtz & Zeithaml, 2018), increasing profits and even making managers more creative (Xiao & Kumar, 2021). Experts anticipate that roughly 50% of the current jobs will be automated and mechanised by 2055 (World Economic Forum, 2017), and it is also anticipated that 175 million jobs could be lost by 2022 due to the increasing deployment of robotic technologies. Unlike the traditional robot employed in industrial applications, service robots are primarily intended to assist humans in their daily lives. As a broad definition, customer service robots are “*system-based autonomous and adaptable interfaces that interact, communicate and deliver services to an organization’s customers*” (Wirtz, Patterson, Kunz, Gruber, Lu, Paluch, & Martins, 2018, p. 909). In a nutshell, when it comes to communication, service robots are a cutting-edge, interactive technology that can benefit greatly from strategic interventions. The hospitality industry is rapidly adopting service robots to do tasks such as greeting guests, serving meals and processing guest checkouts (Battour *et al.*, 2022). In recent decades, service robot research has increased significantly across various disciplines like information systems (Collins, Dennehy, Conboy, & Mikalef, 2021), robotics (Pinillos, Marcos, Feliz, Zalama, & Gómez-García-Bermejo, 2016), social psychology (Kiesler, Powers, Fussell, & Torrey, 2008) communication studies (Wang, Tian, & Shao, 2020), neuroscience (Westlund *et al.*, 2017) and indifferent countries like Taiwan (Kuo, Chen, & Tseng, 2017), China (Zhang, Balaji, & Jiang, 2022), India (Sinha, Singh, Gupta, & Singh, 2020), Australia (Khosla & Chu, 2013), Italy (Brondi, Pivetti, Di Battista, & Sarrica, 2021) and US (Dootson, Greer, Letheren, & Daunt, 2022).

Prior studies have determined how the features and design of robots affect interactions with customers and have explored more about general acceptance (Chuah & Yu, 2021; De Keyser, Köcher, Alkire, Verbeeck, & Kandampully, 2019; Rafaeli *et al.*, 2017; Wirtz *et al.*, 2018; Heerink, Kröse, Evers, & Wielinga, 2010). It has been highlighted by existing studies that various forms of service robots exist. They can be virtual such as Jamie which is the virtual agent for ANZ bank or the personified one such as Nao, and the appearance can vary from machine form such as robots handling luggage to a non-human entity in the form of human such as Pepper or Sophie. Researchers have looked at how customers react to robots based on their level of anthropomorphism (Choi, Choi, Oh, & Kim, 2020), their personality (Tay, Low, Ko, & Park, 2016) and the type of interaction they have with them which can be through text, voice or the touch-based interactions (Lestingi, Askarpour, Bersani, & Rossi, 2020). Significant effort has been put forth in recent years on getting an understanding of the function that anthropomorphism serves pertaining to service robots, and it has resulted in contrasting findings (Blut, Wang, Wunderlich, & Brock, 2021). Few researchers have discovered that humanoid service robot interactions actually reduce client comfort (Mende, Scott, van Doorn, Grewal, & Shanks, 2019), which in turn can decline the consumer acceptance of robots. This is probably because of the enhanced feelings of obscurity and uneasiness associated with human-like robots (Kim, Baik, & Kim, 2019). In contrast to this, there are few studies that have demonstrated the human-like elements, like a face, limbs or a voice, that can favourably impact customer responses via social cognitive evaluations, resulting in improved conviction and satisfaction (Belanche, Casalo, & Flavián, 2021; Yoganathan *et al.*, 2021). For example, it has been investigated by Nakanishi *et al.*, (2019) that if humanoid robots provide comforting interaction service in hotels and found that it

enhances customer satisfaction positively. On the other hand, research has found that robotic service diminished affective experience of customers in hotels (Chan & Tung, 2019). This may be because of a major drawback of current robotic technology that prevents service robots from accurately mimicking human emotions. Contrarily, Ivanov and Webster (2019) have highlighted that robots and AI have the potential to replace human workers in the hospitality industry. However, it has also been argued by the above-mentioned scholars that all the service procedures cannot or should not be mechanised or carried out by robots as it totally depends on economic efficiency and other interrelated factors. Despite the progress on AI technologies, there has not been enough progress in the study of service robots to warrant their widespread implementation (Wang, Cai, Xu, & Li, 2021).

Synthesising the above discussion, it is clear majority of the research on service robots in academia have centred on questions of adoption (Caić, Mahr, & Oderkerken-Schröder, 2019; Lu *et al.*, 2020; Xiao & Kumar, 2021), or evaluation of services (Yoganathan *et al.*, 2021) or human-like elements in services (Belanche, Casaló, Flavián, & Schepers, 2020a). Although the existing studies give crucial insights about service robots literature, the application and interaction of such robots in the field of delivery and logistics, cleaning services, agriculture, tourism and hospitality services remains largely unexplored. Specifically, earlier studies have not explored some of crucial themes like industry resistance to adopt service robots, robot displayed surfaced emotions, ethical and privacy concerns in this area, nor do they provide an overview of the general structure in terms of the impact of journals, institutions, authors and its trends. Therefore, this paper aims to address this gap and enable researchers to comprehend the advancements and knowledge distributions of this scientific research domain.

The current article is an effort to complement previous review studies and offer a clear direction for future research by conducting a systematic literature review utilising the bibliometric analysis technique. One can enable academic and research advancements in the hospitality industry by figuring out what is behind the developments in service robots study. Consequently, three following research questions have been developed for this study:

- RQ1. How has research on service robots evolved, and which articles are mostly cited?
- RQ2. Which journals, institutes and countries have made the most significant contributions to the field of service robots, and who are the most renowned authors in this area?
- RQ3. What are the themes that are becoming apparent in the service robots' literature?

2. Methodology

2.1 Design of the study

In an attempt to answer the research questions, we have adopted a descriptive retrospective study using bibliometric methodology. The bibliometric methodology encapsulates the application of quantitative techniques (i.e. bibliometric analysis and citation analysis) on bibliometric data (Broadus, 1967; Pritchard, 1969). The most notable advantage of this method is its ability to uncover research patterns, which in turn allows researchers to evaluate the body of literature, make sense of the expansion of our understanding and suggest new avenues for investigation (Albort-Morant, Henseler, Leal-Millán, & Cepeda-Carrión, 2017).

2.2 Bibliography data extraction and analysis

Bibliometric data have been collected from Scopus database, which is one of the largest multidisciplinary database of peer-reviewed literature in social sciences. The beginning of the

bibliometric analysis process involves the selection of appropriate keywords. Boolean operators (OR& AND) are used in the SCOPUS database to search for relevant papers in one search: (TITLE-ABS-KEY("service robot" OR "personal robot" OR "social robot" OR "domestic robot" OR "care robot" OR "Assistive robot" OR "companion robot" OR "interactive robot" OR "sociable robot" OR "non-human service agent" OR "collaborative robot" OR "cooperative robot" OR "anthropomorphic robot" OR "frontline service robot" OR "domestic robot") AND (LIMIT-TO (SUBJAREA,"BUSI")) AND (LIMIT-TO (LANGUAGE, "English))). The search was conducted on August 2022, and the results yielded 332 records published between 1985 and 2022 (Figure 1).

2.3 Software Tools for analysis:

With recent development in bibliometric methods, there are several software tools which facilitate bibliometric analysis. The most relevant tools are BibExcel (Persson, Danell, & Schneider, 2009), CiteSpace (Chen, 2006), SciMAT (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2012), CitNetExplorer (Van Eck & Waltman, 2014a), VOSviewer (Van Eck & Waltman, 2010) and bibliometix R package Bibliometrix (Aria & Cuccurullo, 2017). In the current study, two software packages were used in order to perform the bibliometric analysis. For the purpose of performance analysis, science mapping and network analysis, the biblioshiny package of R programming has been used. For the purpose of pictorial depiction of bibliometric map, a bibliometric visualisation tool, VOS viewer was used (van Eck & Waltman, 2014b). Both tools have been expansively employed by several scholars and, as a result, offer greater dependability for a comprehensive and rigorous bibliometric study (Martínez-López *et al.*, 2018; Suban *et al.*, 2021).

3. Results and discussion

Using the aforementioned methodological approach and tools, we carried out our analysis in the following three dimensions:

- (1) Performance analysis
- (2) Science mapping analysis
- (3) Network analysis using multiple correspondence analysis (MCA)

3.1 Performance analysis:

In order to respond to the first research question, we have used performance analysis to examine the contributions of research constituents (e.g., authors, institutions, countries and journals) in service robots' literature. Performance analyses examine the temporal patterns, productivity and citations of publications.

3.1.1 Descriptive analysis of bibliographic data frame. This study reviewed service robots in the hospitality research published during 1985 and 2022. A total sample of 332 relevant research articles published in 123 publications during the past 37 years by 840 authors, with an average of 21.45 citations per document were examined. The increased average number of citations per document indicates a rapid increase in scholarly articles in the field of service robots. The findings also indicated the year 2022 was distinct or has contributed to the field of service robots' during this period, which got 110 publications in Scopus. Most authors (807 authors or 96.07%) are part of multi-authored studies, while only 3.93% are part of single authored studies (33 authors).

3.1.2 Publication trend. Figure 2 depicts the evolution of service robots-related papers from 1985 to 2022, as depicted by the Scopus database. The total articles published have increased

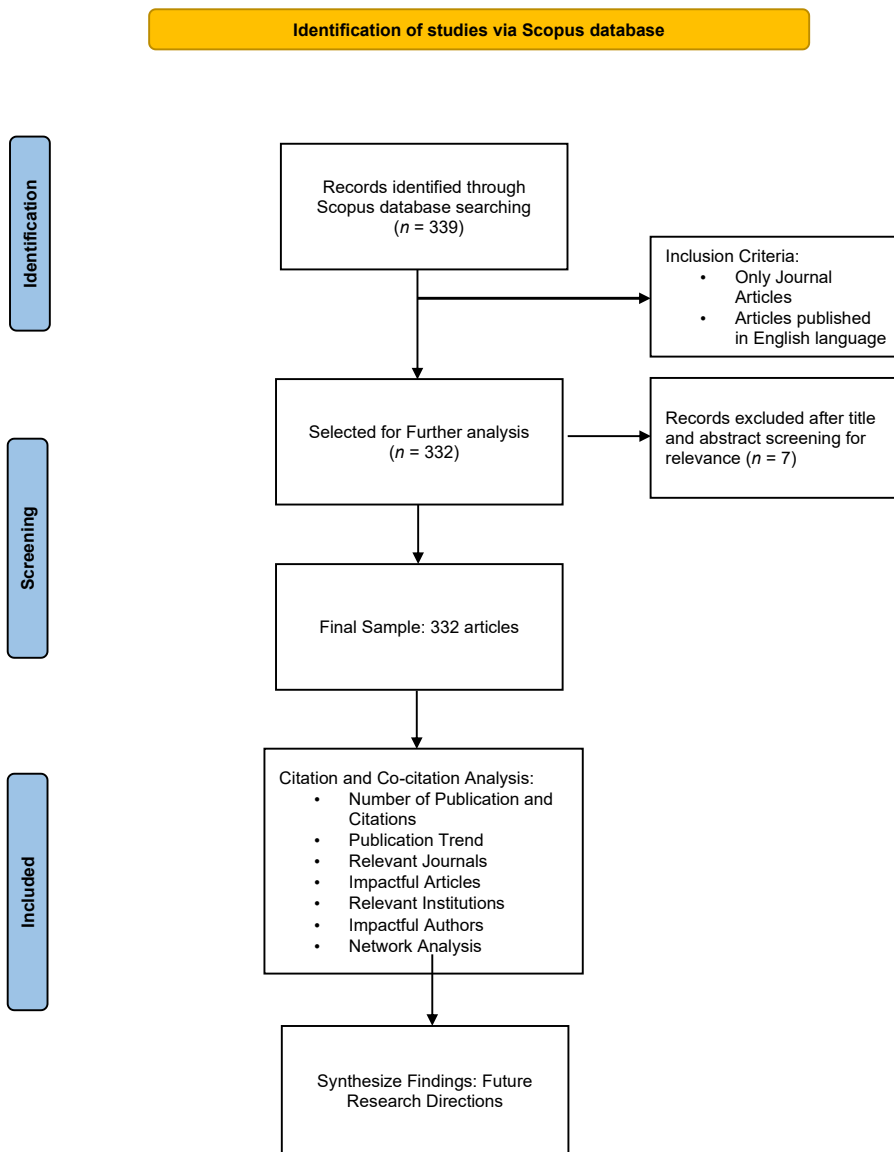


Figure 1.
Identification of studies

Source(s): Figure from authors' analysis

tenfold, from five in 2010 to 110 in 2022. The integration of AI and robotics during the last decade has seen a sudden upsurge from 2010.

3.1.3 Most influential journals. The selected 332 papers are distributed across 123 journals. [Table 1](#) lists the highly influential journals that publish articles on service robots. The top ten journals published 125 of the total papers analysed, accounting for 37.65% of the total.

International Journal of Contemporary Hospitality Management is the most productive publication with 20 articles, followed by *International Journal of Hospitality Management* with 16 publications in service robots research. The interest of customers in service robots in the marketplace supports their inclusion within the scope of these journals.

Figure 3 demonstrates the strong connections between the topic of service robots and a variety of academic disciplines, including social science, computer science, engineering decision science, psychology and medicine. This indicates that the subject is multidisciplinary in nature. Intriguingly, there is not much study being done in other subject areas, particularly neuroscience.

3.1.4 Prolific authors and their affiliated institutions and countries. On the basis of our data, 840 authors have contributed to service robot's research. These authors are associated with 477 organisations spread across 37 different countries. The top contributors by number of publications are displayed in Table 2. Ivanov, S. has published the most articles (N = 8), followed by Mahr, D. (N = 6) and Seyitoglu, F. (N = 6). Paluch S and Wirtz J also have the most citations, with 718 and 653, respectively. Grewal D, Mende M and Vandoorn J shares third rank with 643 citations. Moreover, Table 2 shows the top institutions associated with service robots research along with author's name. In terms of publication, the most productive university is Maastricht University with 17 publications. The University of Surrey is second on the list with 12 publications. The Varna University of Management succeeds them with nine publications.

To some extent, a country's prominence and influence in the area of service robots can be inferred from the number of papers published therein. Between the years 1985 and 2022, a

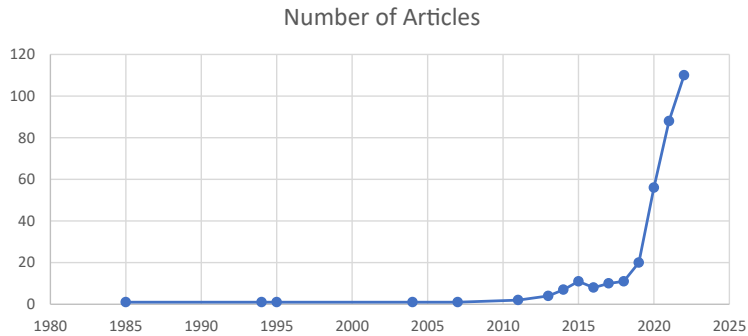


Figure 2. Annual publication trend of 332 papers between period 1985 and 2022 retrieved from Scopus

Source(s): Figure from authors' analysis

Journal names	Count
<i>International Journal of Contemporary Hospitality Management</i>	20
<i>International Journal of Hospitality Management</i>	16
<i>Journal of Service Management</i>	16
<i>International Journal of Production Research</i>	14
<i>Technological Forecasting and Social Change</i>	13
<i>Technology in Society</i>	11
<i>Science and Engineering Ethics</i>	10
<i>Knowledge-based Systems</i>	9
<i>Annals of Tourism Research</i>	8
<i>Journal of Retailing and Consumer Services</i>	8

Source(s): Table from authors' analysis

Table 1. Leading journals publishing on service robots

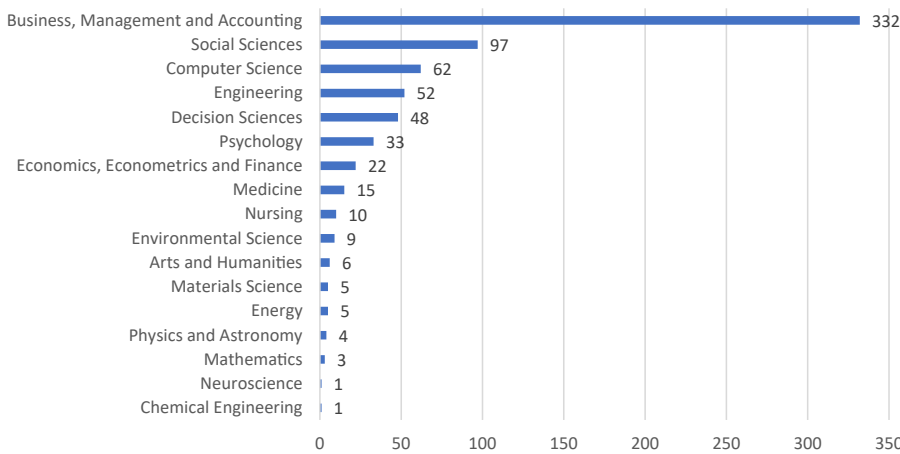


Figure 3. Top disciplines of service robots research in 332 papers

Source(s): Figure from authors' analysis

Top authors Authors	TP	TC	Affiliation	Top institutions	Articles	Top countries		
						Country	TP	TC
Ivanov S	8	224	Maastricht University		17	China	109	320
Mahr D	6	279	University of Surrey		12	USA	95	566
Seyitoğlu F	6	165	Varna University of Management		9	UK	55	374
Wirtz J	6	653	Queensland University of Technology		7	Germany	53	255
Belanche D	5	274	Aarhus University		6	Netherlands	42	1254
Čaić M	5	267	Eindhoven University of Technology		6	Australia	41	219
Mattila AS	5	150	Hanken School of Economics		6	Italy	40	177
Odekerken-Schröder G	5	211	Mardin Artuklu University		6	France	29	198
Paluch S	5	718	National University of Singapore		6	Spain	29	165
Tuomi A	5	82	University of Zaragoza		6	Finland	26	60

Table 2. Analysis of total publications of universities, authors and countries

Source(s): Table from authors' analysis

total of 46 different countries or regions contributed to the publication of service robot-related materials. Figure 4 reveals that out of the top 10 countries, seven are located in European countries (the United Kingdom, Germany, Italy, Spain, the Netherlands and France), one is located in Oceania (Australia), one is located in North America (the United States of America) and one in Asia (China). In terms publications, China has published 109 service robot-related materials, followed by the United States with 95 publications and the United Kingdom with 55 publications.

3.2 Science mapping

Science mapping explores the association between research constituents (Baker, Kumar, Goyal, & Sharma, 2021). Science mapping analysis pertains to the structural relationships

and intellectual interactions among research constituents. By using science mapping analysis, the following section provides the results of the most commonly cited primary authors and journals which have been most frequently cited.

3.2.1 Most frequently cited authors. Based on our data, a total of 25270 authors were identified from 332 publications. In order to conduct a comprehensive analysis, authors with at least 50 citations were incorporated in the analysis, resulting in a total of 94 articles. A co-citation analysis identifies the most repeatedly referenced authors, as evidenced by the nodes that are enlarged (see Figure 5). Among the authors that have been cited most frequently includes 362 citations, followed by *Webster, C.* (304 citations), *Wirtz* (242 citations), *Grewal* (220 citations), *Paulch* (215 citations) and *Mende* (193 citations). These widely-cited scholars have made important strides in the development of robots that provide human-like services.

3.2.2 Most frequently cited journals. The analysis of cited references yielded 7721 sources across 332 articles. In order to conduct a comprehensive analysis, journals with at least 50 citations were included in the analysis, resulting in a total of 43 journals. As the larger nodes in this illustration show, a co-citation analysis can identify which publications are the most

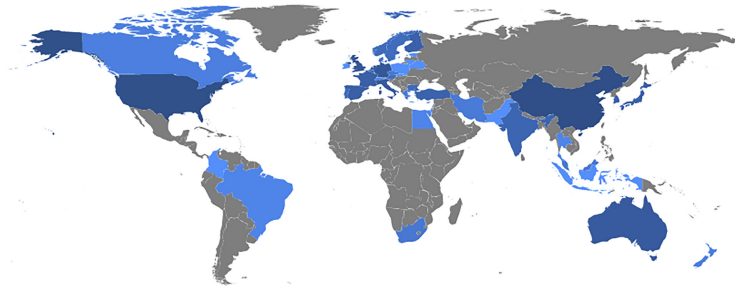


Figure 4.
Country-wise
distribution of service
robots research

Source(s): Figure from authors' analysis

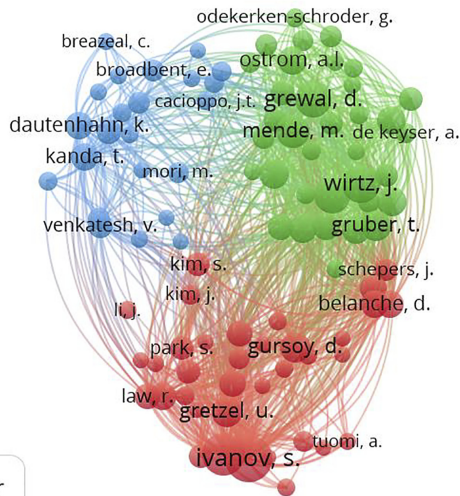


Figure 5.
Analysis of co-citations

Source(s): Figure from authors' analysis

often cited (see Figure 6). Results reveals that *Journals of Service Research* (540 citations), *International Journal of Contemporary Hospitality Management* (386 citations), *International Journal of Social Robotics* (376 citations) and *Journal of Service Management* (337 citations) are the most often cited publications.

3.2.3 Co-occurrence of author keywords. The article's major ideas are summarised in the list of keywords. The article's theme and writing direction in the field of service robots are represented clearly and comprehensibly using keyword analysis. Using the biblioshiny software package, data mining and statistical analysis are performed on the keywords having high-frequency among the research publications. The selection of keywords with a frequency greater than or equal to 10 is done, and Word TreeMaps and network maps are created to display the results (see Figure 7). The most commonly appearing keywords related to service robots research are AI, anthropomorphism, robotics and human robot's interaction, accounting for 11%, 6%, 4% and 4%.

3.2.4 Relationship between authors, keywords and countries. Figure 8 depicts three field analyses illustrating the association between authors, keywords and countries, with authors in the left column, keywords in the middle and countries in the right column. Three field plot analyses confirm that most of the authors have considered service robots as their keyword. However, "social robots", "care robots", "human robots", "collaborative robots" and a number of other terms closely related to service robots were also utilised in numerous research articles. In general, countries like, USA, China and UK focus mostly on service robot research.

3.3 Emerging themes using multiple correspondence analysis

MCA is an exploratory technique for the numerical and graphical analysis which helps to identify a cluster of documents that expresses common concepts by identifying Euclidean representation of the original data (Gifi, 1990). As depicted in Figure 9, conceptual structure map using MCA identified three dominant research clusters in the literature on service

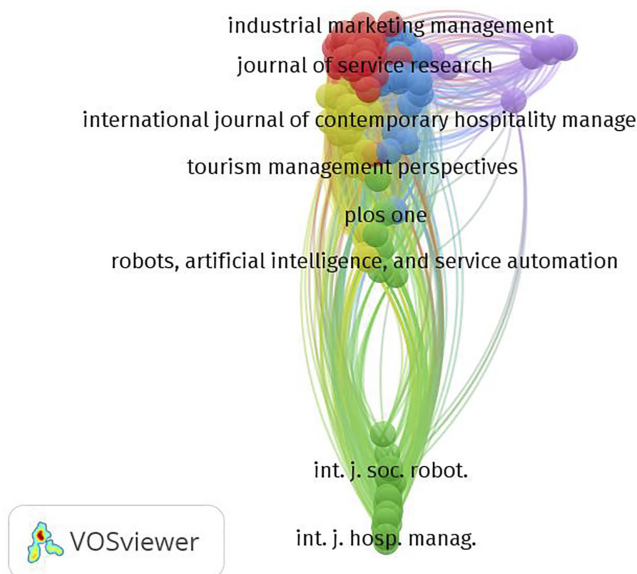


Figure 6.
Frequently cited journals

Source(s): Figure from authors' analysis

IHR
38,2

248

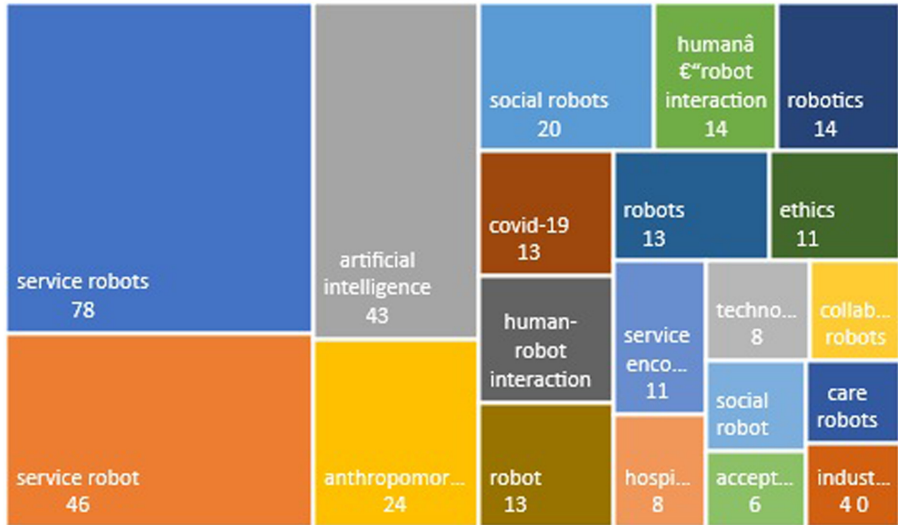


Figure 7.
Co-occurrence of
authors' keywords

Source(s): Figure from authors' analysis

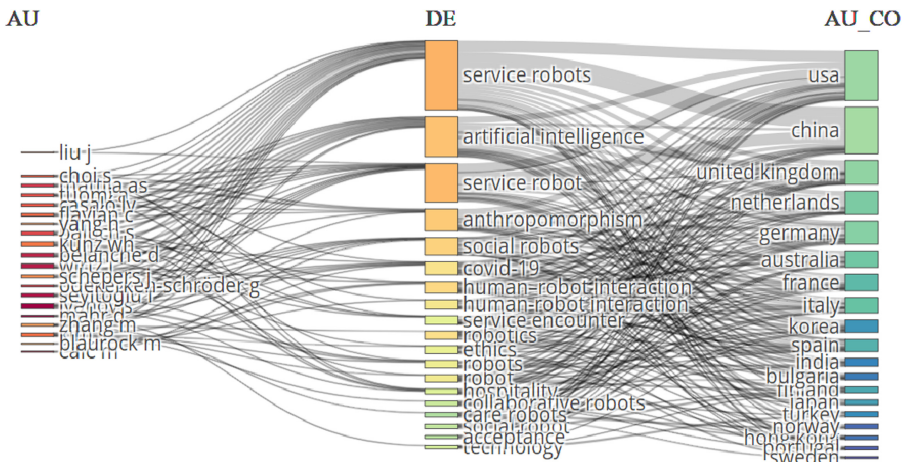


Figure 8.
Three fields plot

Source(s): Figure from authors' analysis

robots. Each cluster is distinct from the others in a significant way. As determined by the analysis, the largest research cluster in the area of service robots focuses on the adoption and integration of service robots in customer service. Anthropomorphism is another dominant research domain in service robot's research. The final cluster describes the incorporation of AI into robotic service.

3.3.1 Cluster 1: adoption and integration of service robots in customer service. In cluster 1, the citing articles are mainly concerned with the adoption and integration of service robots and its impact on customer service. In cluster 1, *Wirtz et al. (2018)* has the highest citations (466 citations), followed by *Vandoorn, J (368 citations)*, *Bolton, RN. (227 citations)* and *Mende (222 citations)*. Robots powered by AI have expanded beyond warehouses and factory

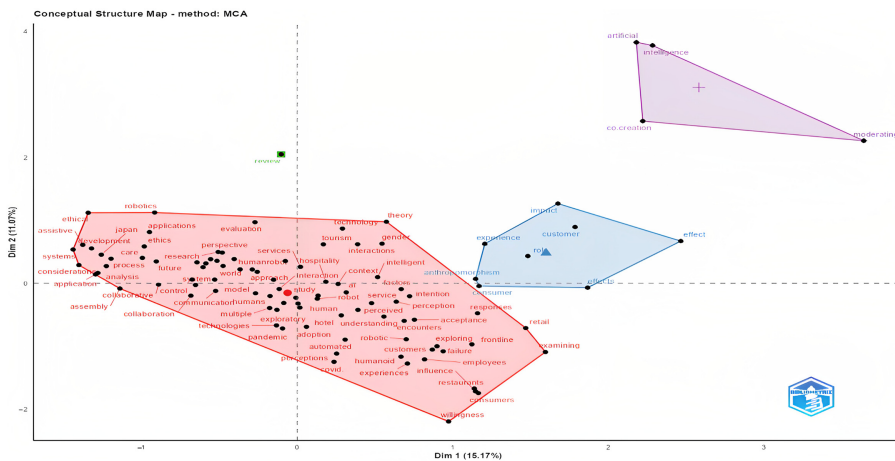


Figure 9. Multiple correspondence analysis (MCA) of high frequency keywords in the field of service robots

equipment. AI-powered solutions are making their way into the hospitality, healthcare and travel industries (Buhalis *et al.*, 2019). AI service robots have broadened the definition of customer service beyond human interaction to include interactions between humans and machines (Tussyadiah & Park, 2018). For instance, Pepper, a humanoid service robot, greets clients at a Pizza Hut in Singapore, takes orders, processes payments and even provides entertainment. Increasingly, businesses are using service robots to enhance the quality of their services, cut expenses and better compete in the market (Chuah, Aw, & Yee, 2021). Besides, most research on public attitudes concerning robots has relied on pre-existing technological acceptance models or extended versions of these models.

3.3.2 Cluster 2: anthropomorphism and its impact on customer service. In cluster 2, the citing articles are mainly concerned with the anthropomorphism and its impact on customer service. In cluster 2, Belanche, Casaló, Flavián, and Schepers (2020b) has the highest citations (130 citations), followed by Tung (2017) (127 citations), Lu *et al.* (2020) (113 citations), Van Pinxteren (2019) (91 citations) and Blut *et al.* (2021) (55 citations). The term “anthropomorphism” refers to the practise of imputing human emotions, thoughts and behaviours to things that are not actually capable of them (Epley, Waytz, Akalis, & Cacioppo, 2008). The tourism and hospitality industries have found that anthropomorphism is a fruitful medium for marketing and communication (Ding, Lee, Legendre, & Madera, 2022). Its purpose is to place a company’s name or product favourably in the minds of prospective customers by analysing the hospitality and tourist industry’s competitive landscape (Lee & Oh, 2021). Furthermore, it has been established that anthropomorphising technology can enhance advertising results. Interfaces that mimic the human experience strengthen client confidence in technology by boosting their own sense of competence (Waytz, Heafner, & Epley, 2014) and are less likely to suffer trust breakdowns (De Visser *et al.*, 2016). In a similar fashion, anthropomorphism induces people to remain more connected to something that is not human (Yang, Aggarwal, & McGill, 2020), it can also be used to get people interested in a brand, a place or a product (Shao, Jeong, Jang, & Xu, 2020). Mascots are often utilised in the hospitality and tourism industries as one illustration symbolise an organisation (like Mr. Balloo Bear from the Epirus Palace Hotel).

3.3.3 Cluster 3: Integration of artificial intelligence in the customer service. In cluster 3, the citing articles are mainly concerned with the integration of technology (i.e. AI) in the

customer service. In cluster 3, [Tussyadiah \(2020\)](#) has the highest citation (126 citations), followed by [Jörling \(2019\)](#) (70 citations), [Fernandes \(2021\)](#) (63 citations), [Mettler \(2017\)](#) (52 citations) and [Benbya \(2020\)](#) (51 citations). AI refers to the programs, machines and algorithms that demonstrate intelligence ([Shankar, 2018](#)). Big data, machine learning, smart robotics, the Internet of things, virtual and augmented reality applications, artificial neural networks and so on are all part AI ([Pereira, Hadjielias, Christofi, & Vrontis, 2021](#)). The hospitality sector and tourism is one that has been affected by technological development ([Buhalis, 2020](#); [Tussyadiah, 2020](#)). Over the last two decades, several information and communication technologies (ICT) have been adopted to enhance the pre-, during- and post-trip experiences of visitors. AI has improved ICTs by making it easier to combine offline and online/virtual components ([Ding et al., 2022](#)). In greater or lesser measure, all of these innovations have contributed to the customisation and provision of technologically enhanced tourist encounters ([Grundner & Neuhofer, 2021](#)). In the hospitality industry, AI has increased the usage of robotics applications that increase client interaction, such as in hotels and restaurants ([Doborjeh, Hemmington, Doborjeh, & Kasabov, 2021](#)). Travellers may make better informed decisions and have more enjoyable vacations, thanks to AI's ability to quickly sift through vast amounts of data ([Bulchand-Gidumal, 2020](#)).

AI and robots (AIR) are only two examples of the cutting-edge technologies being used by the hospitality and tourism sector to enhance the guest experience. Due to these technological developments, tourism is now smart tourism, which opens up brand-new fields of study ([Goel, Kaushik, Sivathanu, Pillai, & Vikas, 2022](#)). Marketers need to keep in mind how end-users feel about AIR because consumer acceptance of technology, notably AIR, is on the rise and will provide the necessary boost to the tourism industry. Marketers and service providers face a formidable challenge in trying to decipher how customers feel about and react to AIR. Besides, some of the most fundamental functions for guests, including porters, room service and concierge, have been automated by AIR. Games, stories and other forms of entertainment are also being played out on AIR. Studies have contended that consumers perceive AIR as more practical and simpler to use because of the automation of services ([Wirtz et al., 2018](#)). [Tussyadiah, Zach, and Wang \(2020\)](#) note that the availability of humanoids to act as guides or companions to visitors increases customer involvement. AI is being used by service providers to provide customers with virtual tours of properties and locations ([Buhalis et al., 2019](#)). AIR assists the hotel sector in surprising visitors through the provision of customised and individualised services. For instance, tailored itineraries are created for guests by mapping their interests and habits ([Pan, 2021](#)). Guests can now control the atmosphere of their rooms without human interaction ([Lin, Cui, Wang, Wu, & Lin, 2022](#)).

4. Discussion and implications

This paper attempts to investigate service robots research and chart its progress over the last three-and-a-half decades. This study used a comprehensive bibliometric analysis of 332 publications from 123 journals published between 1985 and August 2022. For the purpose of addressing the research questions that were predefined, this study used bibliometric method such citation, co-citation and keyword co-occurrence analysis.

Analysis of citations shows that the number of articles has increased steadily pertaining to service robots over the last decade. First stage (1985–2015) represents the field's early years with few publications. Post-2015, the literature on service robots enters a second phase with a steady increase in publications. The most-cited work in this field has been "Brave new world: service robots in the frontline" ([Writz et al., 2018](#)) with 508 total citations. In addition, *Paluch S and Wirtz J* are the most prominent authors based on total citation and average

citation per document. When it comes to research on service robots, the *International Journal of Contemporary Hospitality* has published the most articles with a total of 20 publications. One of the most influential universities in the world in terms of productivity is the Netherlands' Maastricht University. China wins out as the most influential country in terms of output, but the Netherlands takes the cake in terms of overall citations. These findings feature the most influential researchers on the topic of service robots, and they demonstrate that top researchers and academics are becoming increasingly interested in this field. *Ivanov Sand Wirtz* are the most frequently mentioned researchers in the subject of service robots, according to a co-citation analysis. The *Journal of Service Research*, *The International Journal of Contemporary Hospitality Management*, and *The International Journal of Social Robotics* are among the most cited journals. These results suggest that the leading marketing journals have also been the leading outlets to the field of service robots. Keyword analysis reveals "Service robots", "artificial intelligence", "anthropomorphism", "robotics" and "human robots" interaction' are the most often used keywords in service robots' literature. These keywords offer insight into the focal areas that have dominated service robot research over the years.

Finally, we employed multiple correspondence analysis to identify emerging themes from the literature on service robots. Results demonstrate that three study streams have primarily influenced service robots research: "adoption of robots in customer service", "anthropomorphism" and "Integration of Artificial Intelligence".

Both academics and business leaders can learn a lot from our findings. This research has substantial scholarly insights since it identifies the most important papers, journals and institutions that have affected the field of service robotics research and provides insights into the most influential contributors to this area of study. We also contribute to theory by outlining the major themes arising from the literature on service robots, and we track the field's steady development over time. Our research aims to provide managers with an in-depth explanation of the service robot concept so that they may better grasp the complexities of the idea before committing to implementing it in their firm. That is, this research would be useful for managers in comprehending the central conception of service robots as a strategy, which in turn would encourage them to think about this idea as an element of strategic intervention for their firms. In addition, managers would benefit from conducting research since it would lead them to potential informational resources.

4.1 Limitations and future research opportunities

This research is a rare attempt to give a systematic summary of the literature on service robots. Despite the rigour, significance and scope of this study, there are several limitations that must be acknowledged. The most notable limitation of this inquiry is its reliance on only Scopus database for gathering the data. To prevent unnecessary redundancy and duplication, the vast majority of bibliometric research relies on a single database for analysis, but doing so can mean missing out on papers that could be very helpful to the field of service robots. Regarding the prospects for future study, the broad literature evaluation using bibliometric methodologies identifies several crucial future research directions. This study focuses exclusively on value service robots within the business and management disciplines. Therefore, more research in the future should focus on exploring this idea from multiple disciplinary perspectives. Secondly, considering the infancy of this discipline and its quick expansion, there will undoubtedly be a plethora of future seminal works written in this field. Therefore, there should be a continual research effort through a bibliometric analysis focused on service robots every 5–7 years. This would ensure that the field remains pertinent for future scholars, which will thus help it to continue to advance.

In conclusion, there are plethora of methods for doing a literature review using bibliometric analysis. Three of these analytic approaches were used in this investigation. Therefore, other bibliometric methods should be used in future research in order to better understand this topic.

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Further reading

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