



## Chatbots in hospitality and tourism: a bibliometric synthesis of evidence


Fateh Mohd Khan\* , Aligarh Muslim University, India  
Mohammad Khalid Azam , Aligarh Muslim University, India  
Corresponding author: [gd0976@myamu.ac.in](mailto:gd0976@myamu.ac.in)

Chatbots are now widely used in the hospitality industry because they offer round-the-clock support, engage clients in human-like dialogue, and lighten the workload of human agents. However, despite being a relevant technology, scholarly research on the application of chatbots in Hospitality and Tourism remains scant and dispersed. The present review employs a bibliometric review approach to synthesize this domain and identify relevant research lines for future academics. This study uses a mixed review methodology that combines the SPAR-4-SLR protocol and bibliometric tools. Using the Scopus database, the authors compiled 164 articles about chatbots in hospitality and tourism research. The data were examined using Vosviewer, Bibliometrix-R and MS-Excel. This review, which tries to comprehend the changes in this domain over the last eight years in terms of prolific writers, most prominent journals, significant issues, and the field's intellectual and social structure, serves as the foundation for research on chatbots in hospitality and tourism. The findings indicate that this field is still in its infancy. To aid researchers in advancing this field of study, this review aims to offer deeper insights for the pursuance of future research.

Keywords: bibliometric review, chatbots, hospitality, tourism, visualization

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### Introduction

Chatbots are understood as machine-based conversation systems that connect with human users using terminology more similar to genuine conversational speech (Liu & Duffy 2023). The current literature describes a chatbot as "an artificial intelligence program and a Human-computer Interaction (HCI) model" (Adamopoulou & Moussiades 2020, p. 1), which is complemented by cloud technology, big data, advanced mobile technology and biometrics, while taking cues from natural language processing such as semantic analyses, which generates answers sourced from databases. Textual or spoken exchanges may occur in any style while interacting with a chatbot. Interactions with chatbots are made possible by sophisticated backend systems, which make the process of interacting with end users straightforward (Li et al. 2021). Access to the chatbot interface may be gained via specialized devices such as Google, Siri, and Amazon Alexa, in addition to personal PCs and mobile devices. Chatbots are known to facilitate

customers with activities such as selecting, adopting, buying and disposing of products and services (Carvalho & Ivanov 2023). Conversational system capabilities are being made available for use in sales, marketing, and customer support due to the growing popularity and use of digital intelligent assistants and chatbots (Ladeira et al. 2023). They can give clients human-like dialogues that are more interesting since the discussions are powered by machine learning and clever software algorithms (Pillai & Sivathanu 2020).

In recent years, the hospitality and tourism field has witnessed a significant transformation with the advent of chatbot technology. Chatbots, driven by artificial intelligence (AI), have emerged as a powerful tool for enhancing customer engagement and improving service delivery in the hospitality and tourism industries (Pereira et al. 2022). These virtual assistants can simulate human-like conversations, provide personalized recommendations, and offer round-the-clock assistance to guests, making them an invaluable asset to businesses in this sector (Jung et al. 2023). The application of chatbots in hospitality and tourism extends beyond basic customer interactions. They are now employed in various aspects of the industry, i.e., tourism (Belanche et al. 2021), shopping/retail (Song et al. 2023) and airlines (Pillai & Sivathanu 2020), providing support for a diverse variety of goals and responsibilities. By harnessing the power of natural language processing and machine learning algorithms, chatbots can understand user queries, interpret their intentions, and respond with relevant and accurate information (Carvalho & Ivanov 2023). This streamlines operations and enhances the guest experience, increasing customer satisfaction and loyalty. Furthermore, chatbots offer several advantages over traditional customer service channels (Jung et al. 2023). They are available 24/7, eliminating the limitations of time zones and enabling guests to receive immediate assistance whenever required. Chatbots can handle multiple inquiries simultaneously, ensuring efficient and timely responses, even during peak periods (Tuomi & Ascensão 2023). Moreover, they provide a consistent level of service, eliminating human errors and ensuring uniformity in information dissemination. Consequently, using an AI chatbot is becoming the most prominent new trend in academia and industry (David-Ignatieff et al. 2023). Customers who shop online usually find it more tempting to buy from a business that provides real-time communication with greater engagement, such as chatbots (Sivaramakrishnan et al. 2007). The State of Chatbots Report found that 27 percent of adult customers in the United States are open to purchasing basic items through chatbots (Drift 2018). Over the course of the last several years, hospitality operators (hoteliers) have been assigning an increasing amount of frontline activities to machines. These machines range from artificially intelligent (AI) customer care assistants (such as chatbots) to service robots (Tuomi & Ascensão 2023). Chatbots are increasingly being used in place of human agents to carry out specific activities in service provision across various sectors, with hospitality and tourism being some of the most prominent examples of this trend (Gursoy et al. 2023). In particular, recent literature in hospitality and tourism management has been vociferous about how "intelligent automation" of frontline service work requires positions in the hospitality industry to be rebuilt to leverage people's and machines' unique skills (Tussyadiah 2020).

By critically analyzing existing research, this review article aims to provide insights into the potential of chatbots in shaping the future of hospitality and tourism. It also addresses key considerations associated with chatbot implementation. Ultimately, this article seeks to serve as a valuable resource for researchers, practitioners, and decision-makers interested in harnessing chatbot technology's transformative power in the hospitality and tourism industry. To fulfil that purpose, we carried out a bibliometric variant of systematic review that broadly includes (i) performance analysis for charting the trends of the domain and (ii) science mapping via co-occurrence analysis, complemented by thematic mapping to chart the intellectual knowledge structure of the domain. These tools helped us identify the performance and science of the domain, as these indicators are considered relevant from the point of view of in-depth comprehension and understanding of the domain (Patil & Rahman 2022). Based on the aforementioned rationale and following state-of-the-art bibliometric reviews (Al-Ansi et al. 2023; Li et al. 2023), we pursue the following research objectives (RO) in our bibliometric enquiry to: (1) highlight the publication trends in

chatbots in hospitality and tourism; (2) identify the leading authors, journals, articles and countries in the domain of chatbots in hospitality and tourism; (3) to determine the main themes (structure of knowledge) and topics that characterize the intellectual structure of chatbots in hospitality and tourism; and (4) outline future research lines in chatbots in hospitality and tourism.

After this introductory section, we discuss the review methods employed to map the domain. The next section elaborates on the results and findings of the review article, followed by examinations of the results while also suggesting future research directions.

### Methodology

Table 1 shows review process and bibliometric information related to research on chatbots in hospitality and tourism.

**Table 1. Review Protocol using the SPAR-4-SLR Protocol**

Assembling → Arranging → Assessing		
<b>Identification</b> <i>Domain:</i> Chatbots in Hospitality and tourism <i>Research Objectives:</i> Intellectual structure and Performance trends of chatbots in hospitality and tourism (RO1 to RO4) <i>Source Type:</i> Peer-reviewed Journal Articles & Conference Proceedings <i>Source Quality:</i> Scopus Journal List (2022), ABDC JQL-2022	<b>Organization</b> <i>Organizing Codes:</i> Article Title. Journal title, author name, author keywords, number of citations, country of affiliation, and publication year  <i>Organizing framework:</i> Not Applicable	<b>Evaluation</b> <i>Analysis Method:</i> <i>Performance Analysis:</i> article publication trend, article, author, country, and journal performance <i>Science mapping:</i> bibliographic coupling <i>Software:</i> Bibliometrix in R, Vosviewer <i>Agenda Proposal Method:</i> Thematic Gap Analysis (future research avenues)
<b>Acquisition</b> <i>Search Mechanism and Material Acquisition:</i> Scopus <i>Search Period:</i> Up to May 2023 <i>Search Keywords:</i> See Table 1 <i>Total Number of Articles returned from Search:</i> Scopus n=606	<b>Purification</b> <i>Article type excluded:</i> Non-English Language Papers <i>Article type included:</i> Journals and Conference Proceedings <i>Subject areas:</i> Business, Management and Accounting & Economics, Econometrics and Finance <i>Final dataset for Analysis:</i> n=164	<b>Reporting</b> <i>Reporting Conventions:</i> Tables(metrics), figures(networks), word(narratives)  <i>Limitations:</i> Data type (only English-language peer-reviewed journals were selected), Data limited to Scopus, Review was limited only to bibliometric information.

Source: the authors

This review article employs a mix of bibliometric analysis toolbox and the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) protocol (Paul et al. 2021), which consists of three major stages: assembling (implies the *identification* of research questions and *acquisition* of data), arranging (implies the *organization* and *purification* of data), and assessing (implies the tabulation, *evaluation* and *reporting*).

### Assembling

To find relevant articles on chatbots in hospitality and tourism, this review article compiled the search keywords from past literature reviews published in elite journals. We have mentioned the search keywords used in Table 2. Our search string was run on the Scopus academic database in the "article titles, abstract and keywords" option. Scopus was used because it is the largest and most reliable academic database (Hanaa & Abdul 2023). It has been followed and recommended by several renowned marketing academics (Correia & Kozak 2022). This database is commonly recommended for bibliometric assessments since it offers thorough and quality data for review. The Scopus search returned 606 total documents.

**Table 2. Search Strings**

Key Concepts	Search String (Boolean Operators and Keywords)	References
Chatbots	"Chatbot*" OR "Conversational Agent*" OR "Virtual Service Agent*" OR "Messenger Bot*" OR "E-Service Agent*" OR "Service Robot*" AND	Ramesh & Chawla (2022)
Hospitality and Tourism	"Hospitality" OR "Tourism*" OR "hotel*" OR "Hospitality and tourism" OR "H & T" OR "tourist" OR "travel" OR "destination"	Knani et al., (2022)

### Arranging

The articles found in Scopus were then categorized using the following filters: topic area, document type, source type, and language. We focused on compiling articles published in peer-reviewed quality journals indexed in Scopus as they undergo a stringent review process (Alalwan et al. 2017). Peer-reviewed articles and review papers are essential because they provide information on the development of the domain under consideration. Additionally, the selected language was English, and the subject areas of the domain were restricted to business, management, accounting, and economics. This resulted in a reduced and final dataset comprising 164 articles.

### Assessing

The research questions mentioned in the Introduction section were followed to analyze the 164 articles that made up the final corpus of the literature. The evaluation techniques included (1) performance analysis of publication trends, identification and study of top articles, top journals, top authors and countries (RO1 and RO2), and (2) science mapping techniques, including co-occurrence analysis and thematic mapping, which helped highlight the recurring topics and intellectual structure (RO3) of chatbots in hospitality and tourism. The bibliometric assessment came to its conclusion with the identification of research gaps based on science mapping (RO4). Bibliometrix-R (Aria & Cuccurullo 2017), Microsoft Excel, and VOSviewer (van Eck & Waltman 2010) were the software employed for this work.

## Results

### Publication Trends

Research on chatbots and hospitality in tourism has a history spanning eight years (2015–2023), with a total of 164 publications being published during that time. As is evident from the trends discovered, this domain of study is relatively new. Nevertheless, it is quite rich in the number of publications it has garnered over the course of eight years. Since 2019, the domain has seen rapid expansion (e.g., more than 40 articles published each year), with 2022 being the most fruitful year in terms of publication output (49 articles). We observed that before 2015, there was negligible research in the domain, signifying that the domain is in its early development stage, and there may lie many pitfalls and hotspots in the area for future research.

### Most Prolific Contributors

Table 3 includes top-ranking list of countries and journals with the highest publications. There are 164 articles on chatbots in hospitality and tourism research that have been contributed by researchers from 31 countries and sourced from 63 journals. Most articles have two or more authors (152), and the rest are authored by a single author (12). China is the most productive country in this research domain, with 29 articles to its credit, followed by the USA and Korea, with 17 and 10 articles, respectively. The top three most productive journals in the domain of top-ranked hospitality journals are the International Journal of Contemporary Hospitality Management with 22 articles, the International Journal of Hospitality Management with 19 articles and the Annals of Tourism Research with eight articles. The top most productive authors in the domain are Stanislav Ivanov from Varna University of Management (6), Aarni Tuomi from the University of Surrey (5) and Dogan Gursoy from the University of Zaragoza (4).

**Table 3. Most Prolific Countries and Journals for Chatbots in Tourism and Hospitality Research.**

Rank	Country	Total articles	Rank	Journal	Total articles
1	China	29	1	International Journal of Contemporary Hospitality Management	22
2	USA	17	2	International Journal of Hospitality Management	19
3	Korea	10	3	Annals of Tourism Research	8
4	Spain	10	4	Journal of Hospitality and Tourism Technology	7
5	Turkey	10	5	Journal of Hospitality Marketing and Management	7
6	Hong Kong	8	6	Electronic Markets	6
7	United Kingdom	8	7	Journal of Hospitality and Tourism Management	5
8	India	6	8	Tourism Management	5
9	Malaysia	5	9	Tourism Management Perspectives	5
10	Austria	3	10	Journal of Tourism Futures	4

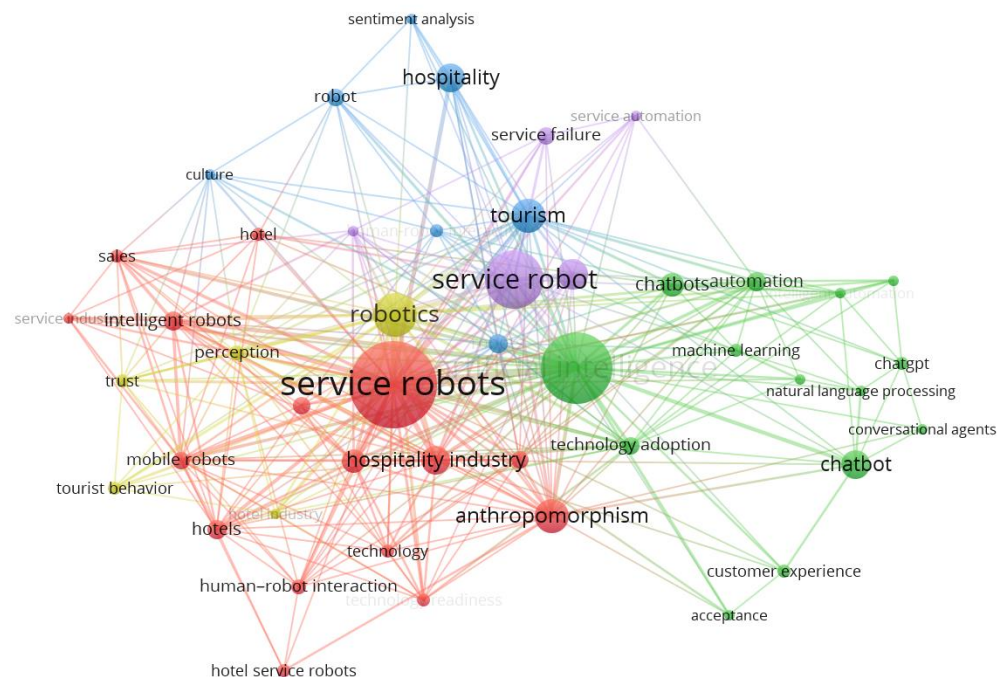
Source: the authors

### Most Cited Articles

The most cited articles on chatbots in tourism and hospitality research focus on myriad issues. Notably, the studies that have garnered the most citations discuss chatbots in the context of tourism and hospitality research in conjunction with service robot integration and willingness (Lu et al. 2019), application of automation in tourism (Tussyadiah 2020), innovative service with hospitality robots (Kuo et al. 2017), service robots (Qiu et al. 2020), tourism service robots (Park 2020), AI-based chatbots (Pillai & Sivathanu 2020), robotic service and brand experience (Chan & Tung 2019), service robot failure (Belanche et al. 2020) and robot concierge (Shin & Jeong 2020).

### Major Clusters or Themes

Following Khan et al. (2023), we conducted a co-occurrence analysis of articles with a threshold of at least three occurrences to establish the key clusters or themes for chatbots in hospitality and tourism research. The outcome is 47 keywords matching the threshold out of 729 articles divided into five major clusters or themes, as shown in Figure 1. The following list summarizes the main characteristics of each cluster.



Source: VOSviewer, the authors

**Figure 1. Keyword Co-occurrence Network of Chatbots in Hospitality and Tourism**

#### Cluster 1 (Red Network): Anthropomorphic Chatbots and Hospitality

The first thematic cluster comprises thirteen keywords and focuses on the phenomenon behind the functioning of chatbots or service robots in the hospitality industry, i.e. anthropomorphism. Anthropomorphism is the process that endows human characteristics to non-human or non-living entities (Caporael 1986). The co-word metrics in this cluster indicate that “anthropomorphism” and “hospitality industry” have been investigated in tandem with *human-robot interaction*, *service industry*, *service quality*, *mobile robots*, *intelligent robots*, etc. Research falling in this cluster explores the behaviour and reaction of travellers towards robotic services offered by high-tech hotels (Çakar & Aykol 2021). Additionally, Li et al. (2021) identified five quality dimensions of chatbot services and examined customers’ effects on user confirmation, leading to user continuance.

#### Cluster 2 (Green Network): Robots and Service-Related Consumption

The second thematic cluster contains nine keywords and concentrates on how service-related consumption behavior was observed during COVID-19 and what role the service robots played in enhancing the customer service experience during the pandemic. The co-word metrics in this cluster indicate that *service failure* and *service robot* have been investigated in tandem with *COVID-19*, *tourism*,

*consumption behavior, and sentiment analysis.* Researchers have examined customer perceptions towards robots working in a restaurant. It was concluded through a grounded theory approach that the introduction of robot chefs in a restaurant process is still a utopian idea (Fusté-Forné 2021). This exploration was part of several initiatives and ideas being considered and examined during pandemic-like situations through which human contact could be avoided.

### **Cluster 3 (Blue Network): Technology and Service Experience**

The third thematic cluster consists of nine keywords focusing on technology's role in the hospitality and tourism industry to enhance the customer experience. The co-word metrics in this cluster emphasize *culture, hotel industry, robotics, technology readiness, tourist behavior*, and *trust*. Research in this cluster has explicitly examined how tech-enabled service robots and their attributes influence customers' experience in hospitality settings (Qiu et al. 2020). Furthermore, Pillai and Sivathanu (2020) explored the antecedents of chatbot adoption intentions of travellers; several antecedents, such as anthropomorphism, perceived trust, and perceived intelligence, were found to influence chatbot adoption intentions.

### **Cluster 4 (Yellow Network): Artificial Intelligence and Hospitality & Tourism**

The fourth thematic cluster comprises eight keywords encompassing the role of artificial intelligence in the hospitality industry. The co-word metrics in this cluster emphasize *conversational agents, customer experience, intelligent automation*, and *chatbot*. Researchers have primarily examined human-robot interactions and the role of robotic agent presence in hospitality settings (Lei et al. 2021). Additionally, the peculiarities of the usage of conversational agents were discovered. In particular, Tung and Law (2017) evaluated chatbot users' intention to reuse. Further, Calvaresi et al. (2021) suggest that chatbot-based activities can build an attractive service proposition for next-generation tourists.

### **Cluster 5 (Violet network): Human-Robot Interaction**

The fifth thematic cluster includes eight keywords concentrating on chatbots and human-robot interaction in the hospitality and tourism sector. The co-word metrics in this cluster mainly emphasize *natural language processing, social robots*, and *virtual reality*. Researchers in this cluster have primarily explored robotic interactions with humans, such as Liu et al. (2023), who discovered that in the hotel sector, clients displayed more unethical consumer behaviour when human employees excluded them compared to service robots, but more unethical consumer behavior when they were serviced by robots as opposed to human workers when the service was inclusive. Additionally, Huang et al. (2021) developed a conceptual framework for customer experience with robotic service agents and provided insights into customer-robot interactions. A thematic map analysis was also conducted using the same set of keywords used in the previous analysis. This analysis can be helpful in the development of novel research themes within a discipline which is useful for informing researchers and stakeholders (Agbo et al. 2021). There are four sections to a thematic map. Here is a rundown of what each section means:

#### *Motor Themes*

The first quadrant includes those themes that are thoroughly developed and serve as the foundation for the journal's study. Because of their great density and strong centrality (i.e., connected by an extensive list of keywords), motor themes are significant for the field of research that focuses on the creation and formation of knowledge. The following topics fall under this quadrant: *hospitality industry and customer autonomous robots, Chatbots, tourism, service robot, COVID-19, and service failure*.

#### *Niche Themes*

Highly developed, closely related, and highly specialized themes are described as having a niche. Significant progress is being made in these topics (Llanos-Herrera & Merigo 2019). This quadrant contains

only one cluster, which includes the themes of (topic) *mixed methods, perceived intelligence, and tourism marketing*.

#### *Emerging or Declining Themes*

Weak themes are illustrated in this quadrant. Weak themes are either in their early stages of development as emerging subjects or are in their latter stages of development as declining topics; both are characterized by low density and centrality. This quadrant includes *conversational agents, service encounter, "human-robot interaction, hospitality management, robots, hotels, and technology*.

#### *Basic and Transversal Themes*

High centrality and low density characterize these basic themes, which are significant and highly central to the field of study but not fully fleshed out (Llanos-Herrera & Merigo 2019). The following themes fall under this quadrant: *service robots, artificial intelligence, and anthropomorphism*.

### **Implication for Managers**

The use of chatbots in the hospitality and tourism industry has increased dramatically in the last several years, and this bibliometric synthesis attempts to provide useful insights to managers in this fast-paced business in an ever-evolving industrial landscape. Firstly, our study highlights the relevance of chatbots to improve visitor experiences by revealing a considerable concentration of research on chatbots in the context of customer service and interaction within the hospitality and tourist industry. These insights may be used by managers in this sector to create and deploy chatbot systems that are tailored to individual customer requirements and preferences, increasing customer happiness and loyalty (Whang et al. 2022).

Second, our bibliometric synthesis notes the growth of creative uses for chatbots in domains including recommendation systems and destination marketing. Based on this study, managers may create strategies that use chatbots to promote tourist destinations and provide tailored travel suggestions. Sidlauskienė et al. (2023) have shown that chatbots are an efficient way to include passengers in pre-trip preparation, provide customized recommendations, and gather useful data for market research. This will eventually result in more focused marketing campaigns and help tackle the heightened competition in the industry. Third, Policymakers should provide frontline employees the chance to upskill or reskill in the event that their jobs are replaced to prepare the hospitality industry for this shift. Odekerken-Schröder et al. (2022) advocate imparting specialized cooperation skills to the employees so that a chatbot and human team can work together effectively. Fourth, businesses using chatbots as a CRM approach should prioritize core service quality. Many businesses use operational, analytical, and collaborative CRM software. Business operations, such as sales, marketing, and service automation, are streamlined by operational CRM. Chatbots' core AI service quality may significantly enhance service automation and boost customer loyalty (Hsu & Lin 2023).

### **Conclusion**

To this end, we concluded that our bibliometric review is the first to gauge the existing research on chatbots in the hospitality and tourism industry. We contributed to the extant literature by identifying the most productive contributors (articles, countries, authors and journals) to the research domain, hence providing a reference point for early-age academics, new-age scholars and industry professionals interested in the domain who wish to go through a brief snapshot of the field. Further, we orchestrate the nomological network, or significant thematic clusters and topics that show how chatbots might influence customer outcomes in the hospitality and tourism industry. With the growing interest in research on chatbots, a wealth of opportunities exists for deepening the understanding and comprehension of the



application of chatbots in hospitality and tourism. We have identified and curated the opportunities for future research:

### Directions for Future Research

Based on the keywords found in the thematic knowledge clusters that belong to the significant studies, we chart several research opportunities for future research. First, the usage of service robots or chatbots in the hospitality industry is an emerging topic, so there is a need for encouragement from research that may expand the understanding of the field from myriad perspectives, such as the perspectives of service providers, managers and staffers. Second, future research can explore (1) the challenges involved in implementing functional service robots in restaurant settings and (2) the perception of the difference between the effectiveness of service employees and service robots (Fusté-Forné 2021). Third, future studies can plan on further explorations into how humans react and respond to AI-based technologies, especially those used in tourist and hospitality settings (Li et al. 2021). Fourth, future investigations can examine the effects of culture, values and beliefs on the acceptance of robotic agents in the service sector in different regional and geographical contexts (Chi et al. 2023). Fifth, such explorations can be conducted using lesser-used research designs such as dyadic and triadic research designs, and method triangulations can be used. Sixth, further explorations may incorporate different case studies that expand the line of inquiry on robotic and human baristas and their effect on visiting intentions and perceived safety (Liu et al. 2023). Additionally, Despite the critical ideas included herein, this study's diversity of bibliometric perspectives is still somewhat restricted. As a result, subsequent reviews may expand the thematic insights included within this one with trending topical insights utilizing different bibliometric analytical approaches, such as PageRank analysis in conjunction with temporal analysis. Future evaluations may expand the *what* and the *how* of the domain by performing a content analysis of the many theories, contexts, and methodologies that are now accessible to serve as a roadmap for future studies on the topic.

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### Authors



Fateh Mohd Khan (OrcID 0000-0002-6400-4348) is a research scholar in the Faculty of Management Studies and Research at the Aligarh Muslim University, Aligarh, India. Mr Fateh conducts research in the area of anthropomorphism and values in consumer behaviour. He has authored and co-authored several research articles in prestigious journals. He can be contacted at [gd0976@myamu.ac.in](mailto:gd0976@myamu.ac.in)



Dr Mohammad Khalid Azam (OrcID 0000-0002-5058-3297) is a Professor of Marketing (retired). He has taught and researched in the Faculty of Management Studies at the Aligarh Muslim University, Aligarh, India, for over 35 years. Dr Azam focuses his research on retail and sales. He has authored and co-authored several research articles published in prestigious journals. He can be contacted at [mkhalidazam@rediffmail.com](mailto:mkhalidazam@rediffmail.com)