

Chatbot recommender systems in tourism: A systematic review and a benefit-cost analysis

Using artificial intelligence for customer services

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This research is focused on the utilization of artificially intelligent (AI), customer service chatbots in travel, tourism and hospitality. Rigorous criteria were used to search, screen, extract and synthesize articles on conversational, automated systems. The results shed light on the most-cited articles on the use of “chatbots” and “tourism” or “hospitality”. The researchers scrutinize the extracted articles, synthesize the findings and outline the pros and cons of using these interactive technologies. This contribution implies that there is scope for tourism businesses to continue improving their online customer services in terms of their efficiency and responsiveness to consumers and prospects. For the time being, AI chatbots are still not in a position to replace human agents in all service interactions as they cannot resolve complex queries and complaints. However, works are in progress to improve their verbal, vocal and anthropomorphic capabilities to deliver a better consumer experience.

CCS CONCEPTS •Software and its engineering~Software organization and properties~Software functional properties~Correctness~Functionality•Human-centered computing~Interaction design~Systems and tools for interaction design•Human-centered computing~Interaction design~Interaction design process and methods~User centered design•Computing methodologies~Artificial intelligence~Natural language processing~Information extraction•Computing methodologies~Artificial intelligence~Distributed artificial intelligence~Multi-agent systems•Computing methodologies~Artificial intelligence~Distributed artificial intelligence~Intelligent agents

Additional Keywords and Phrases: artificial intelligence, live support, customer services, dialogue systems, online services, webchat.

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1 INTRODUCTION

Several customers are using different digital media to search for travel and hospitality services, to compare a wide array of products and their prices, before purchasing itineraries, tours and hotel accommodation. Very often, they may use corporate websites to change their bookings, to cancel reservations and/or to request refunds directly from service providers or indirectly via their intermediaries. At times, they may access an online web chat facility to engage with AI conversational systems, rather than with human customer services agents. These disruptive service technologies are capable of simulating human conversations through electronic interfaces in websites and/or by using social media messaging applications (apps) like Facebook Messenger or WhatsApp Messenger, among others [1, 2]. Such networks enable them to engage in two-way communications with online/mobile users in real time

These interactive technologies are intended to support customers with their recommendations, to assist them in their queries and/or to minimize complaints [3]. They are meant to offer a personalized service and to deliver electronic service quality [4]. Dialogue systems can respond to online users as they are programmed to recognize texts/statements that feature specific keywords and phrases that are usually relate to common consumer issues [3, 5]. Therefore, they can react to verbal communication by providing relevant answers/solutions according to the data they receive.

Many service businesses are integrating widgets like frequently answered questions (FAQ), that are intended to respond to the consumers’ simple queries. Alternatively, they are employing chatbot software to enhance their digital/mobile services to consumers [6]. They are realizing that such interactive technologies offer a myriad of benefits, including increased efficiencies and decreased waiting times to online users, among others.

* Place the footnote text for the author (if applicable) here.

The chatbot technologies can be a good source for the business to collect information from customers and prospects. These systems could add value to customer relationship management (CRM) programs as they provide useful insights on consumer behaviors. CRM and other automated systems would benefit from the customers' data including on their transaction histories, queries, personal preferences, et cetera.

The companies using these dialogue systems are handling additional customers at the same time (thereby improving their response times to them). Hence, they have reduced their reliance on human customer service agents. [7]. As a result, the use of chatbots is reducing the organizations' dependence on human interactions in online customer service settings. Past research indicated that interactive bots could minimize the amount of labor that is required to produce specific results with or without the supervision of employees [8, 9]. Some of them could organize meetings with customers and may even engage in follow-up activities, if necessary. Moreover, they can resolve customer service cases in an efficient manner, request routing to human agents, where necessary, et cetera. Such systems may work like autoresponder sequences. They may or may not be based on elaborate artificial AI capabilities. However, in many cases, they are typically programmed to provide the same solutions to common keywords, messages and phrases [10, 11].

In the event that chatbots cannot re-solve problems (as they cannot identify certain words or statements), their cases are transferred to human customer service agents [12, 13]. Hence, consumers do not have to rearticulate their questions, as service employees could be in a position to follow up on the chatbots' online conversations [14, 15].

In the past few years more researchers sought to explore the use of chatbots that provide online live support to consumers of tourism businesses [4, 9]. Very often, they carried out quantitative research [17, 19, 20] and experiments [12, 21-23] to shed light on the customers' engagement with these interactive innovations. In the main, various authors argued that the chatbots' features and attributes are improving the service quality that is delivered by online travel and tourism firms [6, 16, 19, 24], resulting in better consumer experiences. Few of them reported about the potential pitfalls of these technologies

Moreover, for the time being, there are just few papers that gather, analyze and derive relevant implications from a wide plethora of literature through a systematic review focused on this promising research area. This review paper addresses this gap in academic knowledge. The objectives of this research are twofold: (i) Firstly, it relies on PRISMA's rigorous protocol, to extract and interpret the findings from high impact articles on AI-driven chatbots in travel, tourism and hospitality settings. It identifies the authors who wrote on this topic, it reveals their research questions, describes the methodologies they used for data collection, and (ii) Secondly, it deliberates on the benefits and costs of investing in chatbot systems to improve the quality of online customer service levels. In conclusion, this contribution discusses about the practical implications and outlines future research directions.

2 METHODOLOGY

A PRISMA meticulous approach was required to evaluate, extract and synthesize reliable data from high impact articles [3]. This research design enables the researchers to prepare their evidence-based findings linked to a 4-phase systematic review and meta-analysis. It ensures that the review is trustworthy in terms of its credibility, transferability, dependability and confirmability. It allows prospective scholars to follow rigorous and transparent procedures that are used in this bibliographic study. Hence, they can be in a position to yield the same results that are reported here.

In a nutshell, this study's PRISMA protocol involves the stages reported in Figure 1. Its bibliographic analysis was carried out through Scopus. It considered journal articles that featured the words: "chatbots", "chatbotters" or "bots" in "travel", "tourism" or "hospitality" in their titles, abstracts and keywords. This review extracted contributions that were published in English, from 2017 to the 31st of July 2022. The findings revealed that there were fifty-eight (58) document results when the query specified the following inclusion criteria: ("chatbots" OR "chatbotters" OR "bots" AND "travel" OR "tourism" OR "hospitality") AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")).

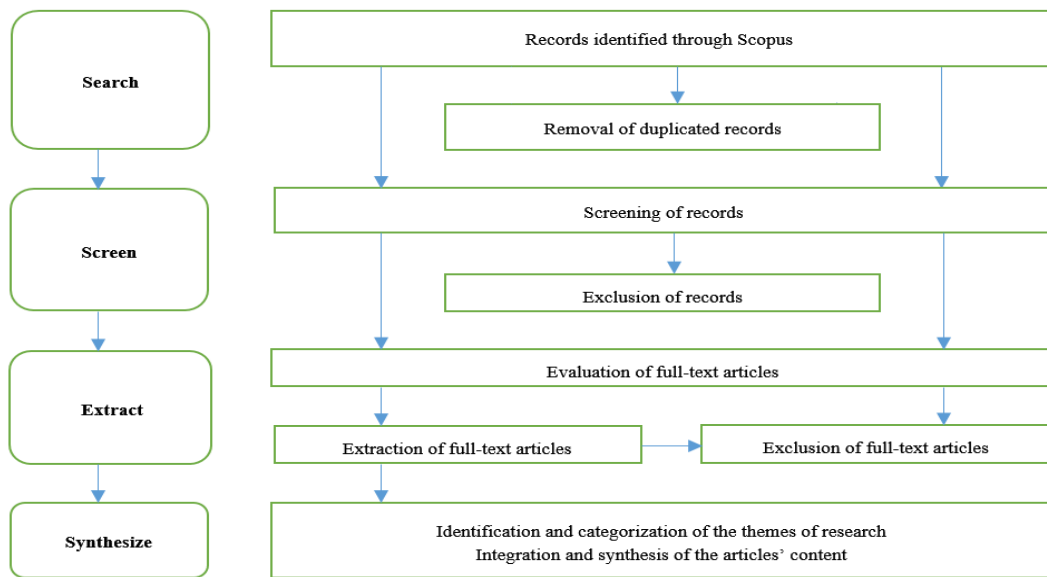


Figure 1. A PRISMA protocol for systematic analysis

All fifty-eight (58) articles that were retrieved through the search query were downloaded and analyzed carefully in all areas. The researchers excluded twenty-three (23) articles (out of fifty-eight) as they were not related to customer service bots or chatbots. Table 1 describes thirty-five (35) articles on this topic that were published since 2017. It sheds light on their contributions' research questions, describes the methodologies that were used to capture and analyze the data.

3 SYNTHESIS ON THE BENEFITS AND COSRS OF CONVERSATIONAL CHATBOTS'

3.1 The benefits

Various authors indicated that conversational chatbots are convenient for travel, tourism and hospitality businesses [25]. In many cases, they clearly outlined their advantages. They pointed out that one of the main benefits included their prompt responses to online customers [16, 17, 26], enhanced operational efficiencies, as they handled many queries at the same time [19, 24], reduced labor costs [13], and time-saving opportunities for the business and their customers [12].

More customers are availing themselves from user-friendly, interactive dialogue systems to resolve queries and/or to finalize their online transactions [31]. Frequently, chatbots are helping them before, during and after they have completed their purchase [19, 32, 33]. In many cases, online users are required to share personal and sensitive data with them [34-36]. Less than 15% of online consumer queries require human intervention [27]. This small proportion of consumer cases may usually involve complex queries including complaints that have to be handled by human agents. Very often, online users are communicating with AI technologies without even knowing. Recent research indicated that more chatbots (as opposed to human customer services representatives) are on the other end of the line, replying to the consumers' questions [28-30].

These conversational systems are usually considered as less intruding than human customer services employees. As a result, such interactive technologies could elicit more information from customers. Evidently, consumers are willing to share sensitive data with a machine rather than with a human [37]. Notwithstanding, the chatbots are better equipped to handle the customers' details and to cross-compare it with previous knowledge, without any human intervention [18, 22]. These interactive technologies can easily acquire, record and store valuable consumer data in every service encounter [38-40]. The information they gather enable them to consistently improve the customers' online experiences [19, 41, 42]. The chatbots' regular and ongoing engagement in two-way communications with online users [25, 26], can have a positive effect on consumer satisfaction [31, 43], trust [16, 26], as well as on their loyalty and/or re-purchase intentions [4, 19]. The relevant literature indicated that individuals are curious about anthropomorphic technologies including conversational chatbots as they invoke norms of reciprocity [16, 17, 26, 42]. Relevant research reported that they feel comfortable engaging with these dialogue systems as they perceive that certain chatbots possess certain attributes and features that are very similar to the cues and mannerisms of human beings [13, 26].

Table 1. A list of extracted articles on the use of chatbots in travel, tourism and hospitality

Authors	Year	Source title	Research question	Methodology	Author Keywords
Pillai and Sivathanu	2020	International Journal of Contemporary Hospitality Management	This study investigates the customers' behavioral intentions to use (and the actual usage) of artificial intelligence (AI)-powered chatbots for hospitality and tourism businesses in India by extending the technology adoption model (TAM) with context-specific variables.	Mixed methods (quantitative and qualitative)	AI-based chatbots; Anthropomorphism; Mixed method; Perceived intelligence; Perceived trust; PLS-SEM; TAM
Melián-González et al.	2021	Current Issues in Tourism	This paper explores the customers' engagement with chatbot technologies in tourism.	Quantitative	anthropomorphism; automation; Chatbots; client interaction; SSTs
Samala et al.	2022	Journal of Tourism Futures	This research presents the authors' views about applications and role of AI in travel & tourism.	Discursive	Artificial intelligence; Chatbots; Human-Robot interaction; Machine learning; Robots; Technologies
Casillo et al.	2020	Pattern Recognition Letters	This article introduces a recommender system that is capable of developing adaptive tourist routes. It suggests points of interest and related services according to the profile of tourists and shed light on contextual aspects.	Experimental	Chatbot; Context-aware computing; Cultural heritage; Digital storytelling; Recommender system; Tourism
McLean et al.	2020	International Journal of Contemporary Hospitality Management	This contribution investigates the impact of the individuals' perceptions about the usefulness of webchat services on their purchase behaviors.	Quantitative	Live chat; Online communication; Online customer support; Online travel providers; Social presence
Li et al..	2021	Electronic Markets	This study identifies key factors affecting the chatbot's online services and investigates their influence on continued utilization.	Quantitative	Artificial intelligence; Chatbot service quality; Extended post-acceptance model of IS continuance; Human-machine interaction; Online travel agency; Technology anxiety
Blöcher and Alt	2021	Electronic Markets	This paper explores how robotics and AI could be used in the hospitality industry. The authors create a conceptual framework in this field of study.	Descriptive analysis	Artificial intelligence; Restaurant industry; Restaurant technology; Robotics; Smart tourism
Prokopenko et al.	2019	International Journal of Innovative Technology & Exploring Engineering	This research provides a descriptive overview of the latest technologies in tourism and destination marketing.	Discursive	Digital-Toolkit; End-to-end analytics; Promoting; Tourist Destinations
Lalicic and Weismayer	2021	Journal of Business Research	This study analyzes the relationships between consumers' values and their reasons for and against perceived value co-creation as well as their behavioral intentions related to using artificial intelligence (AI)-enabled travel service agents' chatbots.	Quantitative	Artificial intelligence; Fuzzy-set qualitative comparative analysis; Perceived co-creation; Service agents; Structural equation modeling

Jiménez-Barreto et al.	2021	International Journal of Contemporary Hospitality Management	This research builds on the self-determination theory, the assemblage theory and customer experience literature, as the authors develop a framework to understand the customer experiences with chatbots.	Mixed methods (quantitative and qualitative)	Artificial intelligence; Chatbot; Customer experience; Hybrid experiential model
Sperlí	2021	Expert Systems with Applications	This research proposes a novel framework, that incorporates intangible and tangible cultural objects into a unified data model, to support tourists in their journeys.	Experimental	Chatbot; Cultural heritage; Deep Learning; Recommendation; Smart tourism; Tourism 4.0
Jelokhani-Niaraki et al.	2021	Journal of Ambient Intelligence and Humanized Computing	This research develops a ridesharing system based on the geosocial network that will be employed in Tehran, Iran.	Experimental	ACO; Allen's' interval algebra; Geosocial network; RCC5; Ride-sharing; VCRQ
Kim et al.	2022	Electronic Markets	This research examines how YouTube could be used to identify factors affecting attitudes towards robots, AI, and service automation in hospitality settings.	Sentiment analysis	Artificial intelligence; Hospitality; Robot; Sentiment analysis; Streaming data; YouTube
Calvaresi et al.	2021	Journal of Tourism Futures	This research highlights the academic and industrial standing points with respect to the current chatbots designed/deployed in the tourism sector. The authors develop a proof-of-concept that embodies the most prominent opportunities in the tourism sector.	Mixed methods (systematic review and focus groups)	Chatbots; Industry focus group; Social chatbots; Tourism academia; Tourism industry; Virtual assistant
Huang et al.	2021	Journal of Hospitality and Tourism Insights	This study reviews existing research and current applications of artificial intelligence (AI) in the hospitality and tourism industry. It further proposes a new evaluation framework to inform the susceptibility of AI adoptions.	Qualitative	Artificial intelligence; Augmented reality; Deep learning; Innovations diffusion; Machine learning; Technology adoption; Virtual reality
Alotaibi et al.	2020	International Journal of Interactive Mobile Technologies	This research proposes "Smart Guidance", an AI text-based chatbot that is developed as a mobile application. It simulates a chat with users in a natural language and provides two-way interactions with its users.	Experimental	Chatbot; Jeddah; Machine learning; Natural Language Processing; Tourism
Chaves et al.	2022	ACM Transactions on Computer-Human Interaction	This research investigates how linguistic differences play a role in shaping the users' perceptions of the human-chatbot interactions in a tourism industry domain.	Experimental	Chatbots; conversational agents; language design; register; user perceptions
Meidute-Kavaliauskiene et al.	2021	Sustainability (Switzerland)	This research explores the use of service robots in tourism. The researchers examine the customers' perceptions on the advantages and disadvantages about robots and the effect of their perceived value on their intention to use them.	Quantitative	Artificial intelligence; Hospitality; Innovation; Service robots; Sustainability; Tourism

Orden-Mejía and Huertas	2021	Current Issues in Tourism	This research seeks to examine the relationship between informativeness, empathy, accessibility, interactivity and chatbot user satisfaction among tourists.	Experimental and quantitative	accessibility; Chatbot; empathy; informativeness; interactivity; smart tourism technology; user satisfaction
Acharya et al.	2020	Journal of Engineering Science and Technology	This research provides insights on the use of travel chatbots that are intended to support users in the planning of their trips, hotel bookings, et cetera.	Experimental	Chatbots; Dialogue state tracking; Interest detection system; LSTM; Personalization; RNN; Tourism; Travel
Mydyti and Kadriu	2021	International Journal of E-Services and Mobile Applications	This research evaluates criteria how chatbots can be implemented in the domains of banking, e-commerce, tourism, and call centers.	Discursive	Artificial Intelligence in Businesses; Chatbot; Digital Transformation
Saluja et al.	2021	International Journal of Applied Science and Engineering	This research involves the development of a travel chatbot that uses a Deep Neural Network (DNN) to provide seamless interactions with human beings. This chatbot suggest safe routes, secure and cheaper hotel accommodation, best places for shopping, etc.	Experimental	Artificial intelligence; Deep neural network; Deep NLP; Long short-term memory; Natural language processing
Pandya and Al Janahi	2021	Transnational Marketing Journal	This research explores how AI technologies can be deployed in recruitment areas. The authors suggest that chatbots could be designated as recruitment officers to support job candidates.	Mixed methods (quantitative and qualitative)	Artificial intelligence in hospitality; Artificial Intelligence in Recruitment; Automation of recruitment; Recruitment; Transformation of recruitment
Dyshkantiuk et al.	2020	International Journal of Advanced Research in Engineering & Technology	This article discusses about high technological innovations in the hospitality industry, including advanced hotel management tools as PMS, Channel Manager, Booking module, Internet Acquiring, Website, Chatbots, among others.	Discursive	Booking module; Business; Channel manager; Chatbots; Hotel; Internet Acquiring; Management; PMS; Tools; Website
Acharya Kim	2019	International Journal of Innovative Technology & Exploring Engineering	This paper develops an algorithm that provides an augmented reality (AR) - based curation system that is intended to support travelers. The researchers customized virtual characters that can be modified according to the surrounding situations or issues that may change in real time.	Experimental	Algorithm Design; Artificial Intelligence (AI); Augmented reality (AR); Optimized Curation System; Theme travel
Fujii et al.	2019	NTT Technical Review	This research provides a demonstration to a tourist-guide service that uses a bot to assist inbound tourists.	Experimental	AI; Image recognition; Tourism
García-Méndez et al.	2022	Simulation Modelling Practice and Theory	This research presents a simulation, modelling, and classification approach to automatically identify human and non-human (bots) as well as benign and malign contributors through WikiVoyage.	Experimental	Classification; Data fabrication; Data reliability; Stream processing; Synthetic data; Wiki contributors

Rafiq et al.	2022	Mathematics	This research identifies factors influencing AI-chatbot adoption and their use in improving customer engagement and experiences.	Quantitative	affective attitude; AI-chatbots; anthropomorphism; cognitive attitude; multivariate analysis; PLS-SEM; S-O-R model; technology adoption; travelers' intention
Casillo et al.	2022	Frontiers in Artificial Intelligence	This research presents an innovative chatbot-based system, that supports tourists who would like to visit the Archaeological Urban Park of Naples (PAUN—Parco Archeologico Urbano di Napoli).	Experimental	chatbots; cultural heritage; experiential learning; knowledge management; ontology
Božić	2022	Software Quality Journal	This research evaluates opportunities and challenges using chatbots in the tourism domain. the authors conceptualize ontologies and test automated chatbots.	Experimental	Chatbots; Functional testing; Metamorphic testing; Ontologies
Solakis et al.	2022	Journal of Tourism Futures	This research sheds light on value co-creation (VCC) processes when consumers engage with automated, artificially intelligent chatbots.	Literature review	Automation; Machine learning; Metaversal tourism; Mixed reality; Natural language processing; Virtual reality
Orden-Mejía and Huertas	2022	Anatolia	This research explores the consumers' satisfaction with a chatbot of a tourist destination (in Victoria la Malagueña, Spain).	Quantitative	destination image; tourist experiences; tourist interactions; Tourist satisfaction; travel planning
Cai et al.	2022	Journal of Travel and Tourism Marketing	This research explores perceived chatbot anthropomorphism cues and their effects on customers' chatbot usage intentions (UIs) in the online travel agency context.	Quantitative	Chatbot anthropomorphism; emotional message cues; mixed method; online travel agency (OTA); perceived enjoyment; perceived intelligence; perceived trustworthiness; social presence cues; tourism marketing; usage intention (UI)
Sydorchuk et al.	2019	Academy of Strategic Management Journal	This research explores how the use of chatbots could positively affect the work of travel companies.	Descriptive	Chatbot; CRM systems; Information technology; Strategic management; Travel agency
Karthikeyan and Jain	2019	International Journal of Scientific and Technology Research	This research uses an offline artificially intelligent bot that is capable of doing almost all tasks as an online bot with the help of Short Message Service/Multimedia Messaging Service (SMS/MMS).	Experimental	Artificial Intelligence; Cryptology; Networking; QR code; SMS/MMS

Note: Sorted from highest to lowest number of citations.

This research confirmed that many persons were finding no difficulties with the use of chatbot that were mimicking human behaviors, including with those that were created with anthropomorphic designs [16]. In fact, various researchers posited that consumers appreciated that the service businesses' dialogue systems were adept in their human-like communications. As a result, the use of conversational chatbots led service businesses to improve their customers' online experiences [41, 43, 44]. In sum, this review postulates that there is a business case for travel, tourism and hospitality companies to invest in these interactive technologies in order to improve their customer centric services, to generate leads and sales conversions [14, 15].

3.2 The costs

Although the latest technological advances may bring a number of benefits to consumers [19, 20], there are still a number of persons who are still not embracing the use of service technologies including dialogue systems running live chat facilities [17, 34, 45].

Recent research suggests that there are still a number of possible challenges including cognitive, affective and functionality factors, as well as integration conflicts and authenticity issues, that could result in negative outcomes like dissatisfied or wary/technophobic consumers [34, 40]. There are several customers hailing from different demographic groups in society including those who do not like and/or refuse to interact with AI-driven interactive technologies like chatbot systems [46]. One of the reasons they despise them, is that these individuals may be concerned about the safety and security of their personal information, as they are aware that these technologies can store and use the data they provide. As a result, they may refuse to communicate with a robot [47, 48].

A few authors argued that prospective customers ought to be informed that they shall be expected to engage with a chatbot technology [4, 37]. Very often, consumers are not aware that they are interacting with a machine that uses human cues [12]. Previous studies yielded contradictory results on this topic. Whilst some of them found that there are consumers who enjoyed using these technologies, others rejected them [13, 34, 49].

The review indicated that, for the time being, a number of chatbots are still not capable of simulating human communications [14, 15, 31]. Works are still in progress for anthropomorphic technologies to completely disguise customer service agents. Chatbots are programmed and predisposed to respond to certain keywords and phrases. Some of them cannot deal with multiple queries in an instantaneous manner. Therefore, the quality of their responses is still very limited [50-52]. Notwithstanding, such interactive systems cannot engage in non-linear dialogues with online users. They are not able to go back and forth in a conversation like a human being [52-55].

4 CONCLUSIONS

Despite the inherent weaknesses and potential pitfalls of conversational chatbots, this contribution implies that there is scope for travel, tourism and hospitality businesses to invest in chatbot technologies to improve their efficiency and response times to a majority of online users (who may not necessarily require extensive customer assistance). By doing so, they could reduce their reliance on human customer service representative, thereby decreasing their labor costs.

Indeed, the tourism businesses can use chatbot dialogue systems in addition to human agents to enhance their electronic services to customers and prospects. Of course, employees are still required to monitor online service delivery and to tackle contingent issues including the handling of disgruntled customers and/or time-consuming cases that require a human presence [56-60].

This review raises awareness on a number of challenges. At the moment, there are still a number of consumers who still refuse to communicate with online dialogue systems. These individuals are unwilling to interact with chatbots, including with anthropomorphic designs that are capable of imitating human communications. There are different reasons why individuals are technologically averse and wary to share their information and/or to converse with a machine. Perhaps, further studies can shed more light on these phenomena. Other colleagues can investigate where, when and why are online users reluctant to use chatbots?

The findings from this review are focused on the use of "chatbots" within the travel, tourism and hospitality sectors. Future researchers may refer to them by using different synonyms like virtual agents and/or virtual assistants, among other notions. Hence, they may consider referring to other keywords when they search through academic repositories on customer-centric chatbot technologies.

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