

Adoption of AI-based chatbots for hospitality and tourism

Chatbots for
hospitality and
tourism

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Abstract

Purpose – This study aims to investigate the customers' behavioral intention and actual usage (AUE) of artificial intelligence (AI)-powered chatbots for hospitality and tourism in India by extending the technology adoption model (TAM) with context-specific variables.

Design/methodology/approach – To understand the customers' behavioral intention and AUE of AI-powered chatbots for tourism, the mixed-method design was used whereby qualitative and quantitative techniques were combined. A total of 36 senior managers and executives from the travel agencies were interviewed and the analysis of interview data was done using NVivo 8.0 software. A total of 1,480 customers were surveyed and the partial least squares structural equation modeling technique was used for data analysis.

Findings – As per the results, the predictors of chatbot adoption intention (AIN) are perceived ease of use, perceived usefulness, perceived trust (PTR), perceived intelligence (PNT) and anthropomorphism (ANM). Technological anxiety (TXN) does not influence the chatbot AIN. Stickiness to traditional human travel agents negatively moderates the relation of AIN and AUE of chatbots in tourism and provides deeper insights into manager's commitment to providing travel planning services using AI-based chatbots.

Practical implications – This research presents unique practical insights to the practitioners, managers and executives in the tourism industry, system designers and developers of AI-based chatbot technologies to understand the antecedents of chatbot adoption by travelers. TXN is a vital concern for the customers; so, designers and developers should ensure that chatbots are easily accessible, have a user-friendly interface, be more human-like and communicate in various native languages with the customers.

Originality/value – This study contributes theoretically by extending the TAM to provide better explanatory power with human-robot interaction context-specific constructs – PTR, PNT, ANM and TXN – to examine the customers' chatbot AIN. This is the first step in the direction to empirically test and validate a theoretical model for chatbots' adoption and usage, which is a disruptive technology in the hospitality and tourism sector in an emerging economy such as India.

Keywords AI-based chatbots, Anthropomorphism, Mixed method, Perceived trust, Perceived intelligence, PLS-SEM, TAM

Paper type Research paper

1. Introduction

Technology is a game-changer for the travel and tourism industry. The innovative technologies such as chatbots, artificial intelligence (AI) and robotics are changing the way the tourism industry presently operates (Tussyadiah, 2020; Bowen and Morosan, 2018). AI-based systems are not just triggering the service and process automation, but they are also being used for direct interaction with customers in various frontline services (Van Doorn *et al.*, 2017). Currently, more than 14% of airlines worldwide are using chatbots for various functions of airlines and it is predicted to reach 68% by 2020. Globally, more than 42% of



airports are planning to adopt chatbot technology (Ghosh and Chakravarty, 2018). The global chatbot market is more than US\$190m and is predicted to increase (Sweezy, 2018).

The chatbot is a computer, programmed to emulate dialogues with humans using voice methods or natural language text (xcubelabs, 2017, p. 1). AI-based chatbots are defined as: "Chatbot is an acronym for chat robot and it establishes communication with humans utilizing AI technology and underlying computer program inbuilt in it" (Ramachandran, 2018, p. 1). As per Adam *et al.* (2020, p. 2), "AI-based Chatbot is a particular type of chatbot that is designed for turn-by-turn conversations with human users based on the textual input." An AI-based chatbot (hereafter simply "chatbots") is an integration of intelligent backend systems and an interface (Guzman and Pathania, 2016). The chatbot interface access may happen through unique devices such as Google, Siri and Amazon Alexa, computers and smartphones. The interaction with a chatbot can occur through textual or vocal format. Chatbot interactions are supported by intelligent backend systems, which facilitate the interaction process with end-users (Sheehan, 2018). The increasing adoption and use of digital intelligent assistants and chatbots are offering conversational system capabilities for sales, marketing and customer service purposes. Because of machine learning and intelligent software algorithms, they provide human-like conversations that are more engaging to the customers (SAP, 2018). The earlier versions of chatbots were simple response platforms, whereas the current AI-based chatbots are much more sophisticated, powerful and capable, increasing the human–technology interaction (Rajan and Saffiotti, 2017). In the hospitality and tourism industry, chatbots are used for travel planning, customer booking, customer support and providing recommendations and suggestions to the customer regarding travel issues. Chatbots are helping tourism companies for 24/7 customer support, more revenue opportunities, improved engagement, automatic lead capturing, reduced overhead cost, competitive advantage and time saving (Bowen and Morosan, 2018; Sheehan, 2018). Companies such as Makemytrip, Expedia, Kayak, Skyscanner and Cheapflights have started using chatbots for customer service (Tomhawk, 2017). The survey of Aspect research software shows that 44% of consumers are looking forward to using AI-based chatbots over human customer care executives (Sweezy, 2018). Technology is impacting all generations and it is required to comprehend the adoption of chatbots by consumers for driving the tourism business effectively (Law *et al.*, 2019; Sweezy, 2018). In the tourism sector currently, there is a dearth of studies that explore the change in the ways tourism is carried out because of the mediation of emerging technologies such as AI and robotics (Tussyadiah, 2020). The areas of robotics, automation and AI technologies have recently drawn the attention of researchers from the tourism domain, albeit limiting their contributions to the descriptions of current functions and possible future implementations and its impacts (Ivanov and Webster, 2019a, 2019b; Tung and Law, 2017; Yeoman and Mars, 2012; Murphy *et al.*, 2019). There is a dire need for research on adoption and acceptance of robotics and AI-based technologies in tourism for technology-mediated interactions (Beldona *et al.*, 2018; Tussyadiah, 2020; Tussyadiah and Fesenmaier, 2009; Tussyadiah and Park, 2018; Ali *et al.*, 2019), the influence of perceived trust (PTR) (Go *et al.*, 2020; Ukpabi *et al.*, 2018; Chi *et al.*, 2020; Tussyadiah, 2020), application of uncanny valley theory (Yu, 2020) and human replacement (Yeoman and Mars, 2012; Yu, 2020; Ivanov *et al.*, 2019). There is a paucity of research examining the adoption of AI-based chatbots (Brandtzaeg and Følstad, 2017; Ivanov and Webster, 2017; Candello, 2017; McLean *et al.*, 2020) as it is an emerging technology in the tourism and hospitality industry. Hence, this research scrutinizes the factors for the adoption of chatbots used for tourism planning (Io and Lee, 2019; Sheehan, 2018; Ivanov *et al.*, 2017). This study distinctively examines the adoption of a chatbot for tourism planning which will help

tourism companies to leverage chatbots technology for consumer experience and consumer engagement by understanding the factors of adoption. It will also be beneficial to the marketers and developers of chatbots to develop them as per the consumer needs. This research focuses on chatbots for tourism planning that encompasses functions of chatbots such as effective and efficient travel plan search, suggestions, travel support and bookings with respect to transport, hotel bookings and other travel packages as per personalized customer preferences in real time. To fill up the above gap and conduct meaningful research, the following research question (*RQ*) was formed.

RQ1. What are the antecedents of the adoption of AI-based chatbots by consumers for tourism?

Technology adoption model (TAM) along with the contextual constructs – anthropomorphism (ANM), perceived intelligence (PNT), PTR, technology anxiety and stickiness to traditional travel planners/agents – are integrated to develop a proposed model to investigate the predictors for the adoption of chatbots by consumers in the tourism industry. The model is empirically validated to resolve the *RQ*. Besides, this study qualitatively interviewed the managers and executives of travel and tourism agencies to facilitate a deeper and more meaningful understanding of the adoption intention (AIN) and actual usage (AUE) of chatbots in tourism. This aids to augment both the validity and relevance of our contribution to the practitioners.

The research has further followed the sections with literature review, hypotheses development, research methodology, analysis of data and results. It concludes with the research discussion and conclusions, theoretical and managerial implications, limitations and future scope for research.

2. Literature review

Adoption of chatbots technology is an emerging subject of research and many studies have been done worldwide in various contexts. The studies conducted for adoption and usage of chatbot technologies are travel, tourism and hospitality companies (Ivanov and Webster, 2019b), service chatbots (Sheehan, 2018), hotel interactive technologies (Morosan and DeFranco, 2019), service robots (Belanche *et al.*, 2020; Mende *et al.*, 2019), chatbots in general (Brandtzaeg and Følstad, 2017) and chatbots adoption in Siri case (Io and Lee, 2019). Extant studies are also discussing the chatbots/robots for tourism and human interaction (Yu, 2020; Mirnig *et al.*, 2017; Stadler *et al.*, 2014; Rosenthal-von der Pütten *et al.*, 2017). To study the adoption of chatbots for tourism, TAM along with human–robot interaction (HRI) variables – ANM, PNT, technology anxiety and PTR – are considered which are context-specific to chatbots for tourism applications.

2.1 Theoretical basis

2.1.1 Technology adoption model. TAM is an extensively used and acknowledged model in technology adoption research and it investigates the behavioral intention to adopt new technology. The user's conviction regarding perceived ease of use (PEA) and perceived usefulness (PUL) of a new technology impacts the user intention (Davis, 1989). TAM was used to study the adoption of social media for selecting tourist destinations (Hua *et al.*, 2017), self-service hotel technology (Kaushik *et al.*, 2015), Web-based self-service technology in the hospitality industry (Lee, 2013) and e-tourism in Egyptian tourism companies (Ghanem *et al.*, 2017). As chatbots are an emerging technology in the travel and tourism industry,

hence to understand the behavioral intention to adopt chatbots for tourism planning, TAM is considered in this research work.

2.1.2 Human–robot interaction. The extant research work discusses the HRI (Bartneck *et al.*, 2009; Deshmukh *et al.*, 2018; Ho and Macdorman, 2010; Yu, 2020; Sheehan, 2018; Bartneck *et al.*, 2007; Gray and Wegner, 2012). The service robots or chatbots' performance depends upon user satisfaction, therefore it is essential to explore the perception of robots among its users as a robot's perception cannot be measured. HRI is a multi-disciplinary area and there are five key dimensions tested by developing the Godspeed questionnaire: ANM, PNT, likeability, animacy and perceived safety (Bartneck *et al.*, 2009). This scale is widely used to understand the HRI (Sheehan, 2018; Yu, 2020; Ho and Macdorman, 2010; Stark *et al.*, 2018; Weiss and Bartneck, 2015; Werner *et al.*, 2012; Willemse and Wykowska, 2019; Zarouali *et al.*, 2018; McGinn *et al.*, 2019; Petisca *et al.*, 2015; Hughes *et al.*, 2015). This study mainly focuses on tourism chatbots; hence, this study has considered ANM and PNT from the Godspeed questionnaire.

2.1.3 Anthropomorphism. In robotic studies, mainly the uncanny valley theory is used very widely. Gray and Wegner (2012), Bartneck *et al.* (2007) and Mori (1970) proposed this theory of uncanny valley which discusses that the people tend to be positive about the things/products which have anthropomorphic features; however, this relationship is not necessarily linear always. ANM is considered as the degree to which consumers perceive robots and other non-human objects as human-like (Ruijten *et al.*, 2019, p. 1). The studies discussed the anthropomorphic characteristics of chatbots and robots (Sheehan, 2018; Yu, 2020; Willemse and Wykowska, 2019; Zarouali *et al.*, 2018; Hughes *et al.*, 2015; Rietz *et al.*, 2019). It is discussed that chatbot's small talk usage changed the users' perception that chatbots are intelligent, reliable and trustworthy (Cassell and Bickmore, 2003). ANM increases the confidence and sense of control; hence, it aids to develop a positive attitudinal response in consumers (Epley *et al.*, 2007; Ho and Macdorman, 2010). Hence, ANM is considered in this work to test the adoption of chatbots in tourism planning to understand its extent of human-like perception during HRI among its users.

2.1.4 Perceived intelligence. The AI has developed the concept of PNT (Ho and Macdorman, 2010; Warner and Sugarman, 1986) and it mainly concentrates on competence, knowledge delivery, sensibility, intelligence and responsible reaction of robot or chatbot (Weiss and Bartneck, 2015; Petisca *et al.*, 2015; McGinn *et al.*, 2019; Hughes *et al.*, 2015). It is challenging for robots to interact with customers intelligently (Bartneck *et al.*, 2009). It is easy for customers to point out the limitation of a robot while interacting with it for a longer period (Rau *et al.*, 2010). The research work of Yu (2020) found that PNT is also linked with the ability/competence of robots to speak different languages, pronunciation and competence to provide the service. PNT in the context of chatbots and personal intelligence agents is discussed as the ability to understand and produce the reply by processing natural language and providing effective results (Moussawi and Koufaris, 2019; Moussawi *et al.*, 2020). PNT is vital for HRI. It is also a key aspect of human and robot collaboration (Hughes *et al.*, 2015). Hence, this research considers PNT as it involves the element of HRI and collaboration to provide competent service to consumers for tourism planning.

2.1.5 Perceived trust. PTR is discussed as the extent to which the consumers sense that the chatbot/robot is reliable and credible (Yagoda and Gillan, 2012; You *et al.*, 2018; Gallimore *et al.*, 2019). Consumers feel safe when trust is developed toward robots (You *et al.*, 2018). PTR in HRI plays a vital role and it is mainly associated with an individual's intentions of risk-taking by trusting the trustee which shows the reliance behavior of individuals (Mayer *et al.*, 1995). Trust is a crucial aspect in the adoption of new technology

such as robot and chatbots (Lee *et al.*, 2017; Kaushik *et al.*, 2015; Park and Gretzel, 2007; McLean *et al.*, 2020). Hence, PTR is considered in this research to understand the reliance behavior of consumers and their feelings of credibility while interacting with chatbots for tourism planning.

2.1.6 Technology anxiety. Technology anxiety develops confusion toward the usage of technology regarding the activity to be conducted and hence reduces the willingness to adopt new technology (Lam *et al.*, 2008; Meuter *et al.*, 2005). Technology anxiety creates apprehension and fear in the consumer's mind toward using new technology (Igbaria and Parasuraman, 1989; Venkatesh, 2000). In this regard, technology anxiety is considered as a crucial psychological antecedent which influences the adoption of new technology (Mani and Chouk, 2018; Evanschitzky *et al.*, 2015).

2.1.7 Stickiness. Stickiness means the website's capacity to retain the attention of the user for a longer period (Gillespie, *et al.*, 1999; Demers and Lev, 2001; Maciag, 2000). Stickiness is also studied regarding mobile applications and it means the degree to which mobile app users revisit the mobile to continue the usage (Racherla *et al.*, 2012; Kim *et al.*, 2016; Hsu and Lin, 2016). Sivathanu (2019) studied the adoption of digital payment systems and discussed "Stickiness" as the users' intention to continue usage of traditional cash payment systems than the new digital payment systems. Stickiness in this work is considered as the travelers' intention to continue booking their travel plans through traditional human travel planners/agents than using the chatbots for tourism.

2.2 Theoretical framework development

TAM is used to examine the adoption of chatbots for tourism as it is comprehensive and widely used to study adoption of technology for tourism (Hua *et al.*, 2017; Kaushik *et al.*, 2015; Ghanem *et al.*, 2017; Pan *et al.*, 2017) and adoption of chatbots and robot studies (Zarouali *et al.*, 2018; Lee *et al.*, 2017).

Along with TAM, context-specific variables concerning HRI (Bartneck *et al.*, 2009; Deshmukh *et al.*, 2018; Ho and Macdormann, 2010; Yu, 2020; Sheehan, 2018; Bartneck *et al.*, 2007; Gray and Wegner, 2012) are considered to provide better explanatory power. The considered variables of HRI are ANM (Ruijten *et al.*, 2019), PNT (Weiss and Bartneck, 2015; Petisca *et al.*, 2015; McGinn *et al.*, 2019; Hughes *et al.*, 2015), PTR (Yagoda and Gillan, 2012; You *et al.*, 2018; Gallimore *et al.*, 2019) and technology anxiety (Evanschitzky *et al.*, 2015; Mani and Chouk, 2018; Meuter *et al.*, 2005). This study also explores the AUE of chatbots in tourism by investigating the association of AIN and AUE (Gupta *et al.*, 2017; Ghanem *et al.*, 2017). Figure 1 depicts the proposed model.

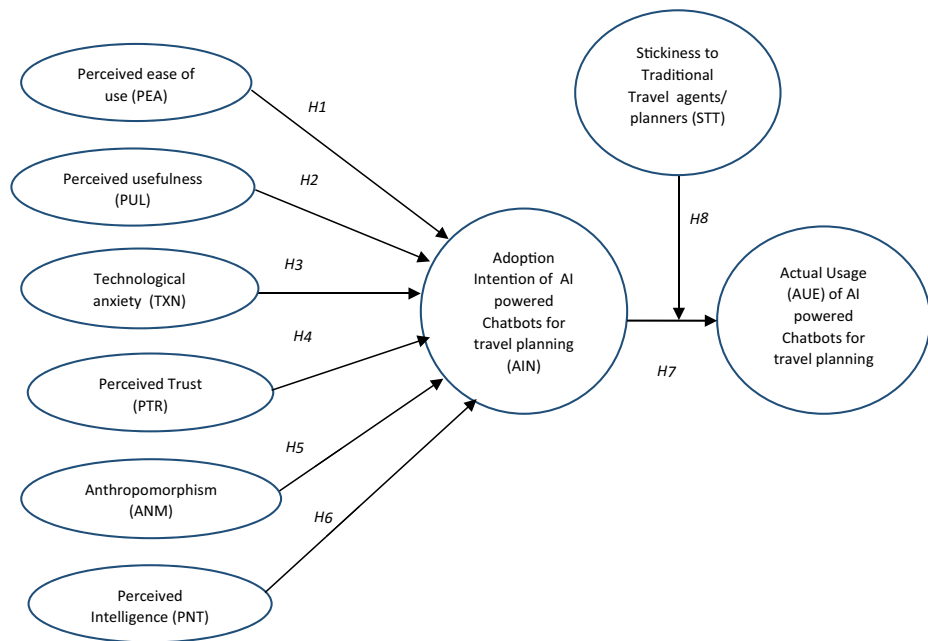
3. Hypotheses development

3.1 Perceived ease of use

PEA is the extent to which a consumer believes that using a particular system would be easy and free of effort. PEA is an antecedent of behavioral intention to use technology related to tourism (Ryan and Rao, 2008; Luque-Martínez *et al.*, 2007; Luo, *et al.*, 2008). It was also found in the tourism app adoption study that PEA does not affect AIN (Pan *et al.*, 2017). The tourists would use technology if they perceived that it is easy to use and helpful for travel planning and during travel. Chatbots are designed and intended to be easy to use for tourism planning purposes, hence hypothesis is formed as:

H1. PEA affects the AIN of chatbots for tourism.

Figure 1.
Proposed model



3.2 Perceived usefulness

PUL is the degree to which a consumer perceives that using a particular system would enhance the performance of the job or task (Davis, 1989). The usefulness of technology for tourism influences AIN, which is confirmed in extant studies of self-service hotel technology (Kaushik, *et al.*, 2015), business-to-consumer (B2C) airline website (Kim *et al.*, 2009), tourism app (Pan *et al.*, 2017), lonely planet website (Luo, *et al.*, 2008), travel search engine (Park and Gretzel, 2007) and self-service technology in resort hotels (Oh *et al.*, 2013). Technology such as chatbots is making tourism easy and helpful for the tourists to plan, solve problems on-site and booking the transport, hotel and other required reservations. Tourism chatbots also provide travel assistance 24 × 7. Therefore the hypothesis is formed:

H2. PUL affects the AIN of chatbots for tourism.

3.3 Technological anxiety

Technological anxiety (TXN) is the extent to which a consumer has a feeling of fear or apprehension that might be faced during the usage of technology (Meuter *et al.*, 2003). TXN is one of the important variables which is discussed as a vital psychological antecedent of technology adoption (Meuter *et al.*, 2005). TXN may reduce motivation because of the confusion of task performance (Meuter *et al.*, 2005). The research found that TXN of individuals can lead to avoiding the usage of technology tools (Meuter *et al.*, 2005; Parasuraman, 2000) and it is an obstacle for the adoption of new technology (Mani and Chouk, 2018). Therefore, it negatively affects the technology adoption (Evanschitzky *et al.*, 2015). In the tourism industry, chatbots are a new technology, which consumers use in many

ways for travel planning purposes; hence, TXN of tourists may affect the adoption of chatbots negatively:

H3. TXN negatively affects the AIN of chatbots for tourism.

3.4 Perceived trust

As per [Komiak and Benbasat \(2003\)](#), trust means the extent to which a consumer feels secured about conducting a transaction with the service provider. Also, trust is considered as the willingness of the consumer to take a risk ([Ba and Pavlou, 2002](#)). In innovation research, the development of trust in e-service providers is a vital topic of investigation ([Komiak and Benbasat, 2003](#)). PTR depicts the consumers' perceptions such as privacy protection, quality of the information and the security provided by the information system ([Ponte et al., 2015](#)). The tourism technology research confirms the positive effect of trust on the behavioral intention to adopt self-service hotel technology ([Kaushik et al., 2015](#)), smartphone apps ([Gupta et al., 2017](#)), online travel purchase ([Ponte et al., 2015](#)), an online website providing information through live chat assistants ([McLean et al., 2020](#)) and emerging technologies in tourism ([Park and Gretzel, 2007](#)). Trust mainly emphasizes the traveler's perception of privacy protection, security and quality of information and services provided by chatbots. Travelers are sharing their personal details with chatbots for their travel planning and booking which makes them skeptical about using these chatbots. Therefore the hypothesis is proposed:

H4. PTR affects the AIN of chatbots for tourism.

3.5 Anthropomorphism

ANM relates to the characteristics of human beings and the behavior of human beings toward non-human things such as chatbots and robots ([Bartneck et al., 2009](#)). When human interaction happens with a non-human entity, the person will scrutinize the behavior and features of the entity to investigate the perceived similarity ([Sheehan, 2018](#)). For example, when the tourists use chatbots for planning the tours, individuals tend to relate it with human customer care executives. ANM of chatbots is discussed in the literature that usage of chatbots for small talks and conversations has raised the perception of users' regarding chatbot's credibility, intelligence, trust and engagement ([Cassell and Bickmore, 2003](#)). [Sheehan \(2018\)](#) confirms the positive correlation of ANM with behavioral intention to use chatbots. The extant literature discussed that computers and machines can be considered as human-like ([Weiss and Bartneck, 2015](#); [Epley, et al., 2007](#)). Chatbots for tourism planning also need to be tested for their human-like behavior as its voice quality, conversation abilities and responses are developed as if human beings are speaking with the customers. Therefore the hypothesis is proposed:

H5. ANM affects the AIN of chatbots for tourism

3.6 Perceived intelligence

In prior literature, it is discussed in an experiment that the speech, voice and appearance are judged as the intelligence of another person or entity such as a robot ([Duffy, 2003](#); [Mirnig et al., 2017](#)). The PNT of a chatbot or robot is considered as its competence, efficiency, use and ability to provide effective output ([Mirnig et al., 2017](#); [Yu, 2020](#); [Moussawi and Koufaris, 2019](#)) and

how it provides solutions to the customers within limited interactions (Bartneck *et al.*, 2009). The literature confirms that intelligent robots are considered to be more alive (Stewart, 2009) and robots providing customized information and interacting with the users have been shown to have an increased adoption (Rosenthal-von der Pütten *et al.*, 2017; Stadler *et al.*, 2014). PNT is one of the antecedents of AIN of hotel service robots (Tussyadiah and Park, 2018) and personal intelligent agents (Moussawi *et al.*, 2020). Chatbots for tourism interact with the customers and provide real-time customized solutions for travel planning. Chatbots are useful in providing real-time solutions to travel bookings by solving problems related to travel planning and scheduling. Hence, the association between PNT and AIN needs to be tested:

H6. PNT affects the AIN of chatbots for tourism.

3.7 Adoption intention

AIN is the subjective probability of an individual's engagement in a certain behavior (Fishbein and Ajzen, 1975). Behavioral intention intends to elucidate and envisage the users' acceptance of new technology (Davis, 1989; Martins *et al.*, 2014; Fishbein and Ajzen, 1975; Venkatesh *et al.*, 2003). AUE is referred to as the help provided by the technology to achieve the targets by using the technology (Burton-jones and Grange, 2013). The present research regarding the adoption of new technology confirms the association between AIN and use behavior of consumers (Hoque and Sorwar, 2017; Wei *et al.*, 2020). The extant research supports the effect of AIN on the AUE of tourism technology (Gupta *et al.*, 2017; Ghanem *et al.*, 2017; Leue *et al.*, 2014). A chatbot is a new technology used by customers to plan their travel. Though they intend to use this new chatbot technology, still the probability of its AUE is not confirmed. Therefore, the relationship needs to be tested:

H7. The AIN influences the AUE of chatbots for tourism.

3.8 Stickiness to traditional human travel agents

Stickiness has been considered as a user's intention to revisit the e-commerce website (Lin, 2007) and mobile app (Kim *et al.*, 2016). Sivathanu (2019) studied the digital payment systems and discussed the stickiness to the traditional payment systems such as cash-based transactions. It means the extent to which users continue to transact using the traditional methods of payment than new technology. Stickiness to traditional human travel agents (STT) negatively moderates the association between behavioral intention and AUE of the digital payment systems (Sivathanu, 2019). It is revealed that STT influences the consumer's intention to transact on an e-commerce website (Lin, 2007). This work considers stickiness as consumer's intention to continue using traditional booking through human travel agents. Existing studies mentioned that stickiness increases the user access occurrence and use time too (Ma *et al.*, 2019; Hsu and Liao, 2014; El-Manstrly *et al.*, 2020). Chatbots are new technology and conventionally customers are accustomed to travel planning using their traditional acquaintance, namely, human travel agents or advisors. Chatbots have many intelligent features to cater to the tourist requirement of tour planning. The chatbots provide various options for travel booking which are cost-effective and time-saving. However, travelers might still depend upon traditional travel agents as the human travel agents tend to maintain a strong relationship with the travelers by adopting marketing strategies to provide customer satisfaction (Seilov, 2015; Mangno, *et al.*, 2016; Litvin *et al.*, 2018). Though consumers have the intention to use new chatbot technology for

travel planning, STT might affect the usage. Therefore, it is necessary to examine the STT moderation relationship between AIN and AUE of chatbots for tourism:

H8. The AIN and the AUE of chatbots for tourism is moderated by STT.

4. Research methodology

This section describes the process for data collection along with the design of the survey instrument. The mixed-method research design helps researchers to evade inconsistency in outcomes of research caused by just focusing on qualitative or quantitative analysis (Creswell and Clark, 2007). The mixed-method approach is used and suggested in tourism studies for a better conclusion of research (Kuo *et al.*, 2017; Tom *et al.*, 2017; Mariani and Baggio, 2020). In this research, the mixed-method approach is used which combines qualitative and quantitative techniques to confirm the reliability and consistency of the conclusions (Kallmuenzer *et al.*, 2019; Creswell *et al.*, 2007). The research design for this study was carried out in the three phases and the data from these two methods were analyzed and validated. In phase one, initially subject matter experts (SMEs) from the tourism industry and travel companies were interviewed to confirm and ensure the accurate measures for the second phase of the quantitative survey. The characterization of all the constructs was adapted from the operational definitions established in the extant research (Table 1). The main themes that emerged from the various dimensions were discussed informally with the managers (notes were taken) from the travel agencies, who were considered the domain experts. These discussions occurred while the request was proposed for authorization to conduct the survey (phase two). This enabled the authors to highlight the importance of AI-based chatbots for their adoption and AUE in the travel and tourism sector. In the third stage, the managers from the travel agencies who had more than 10 years of experience were contacted and questions were asked to understand the AIN and AUE of chatbots. To cross-validate the results and reinforce the robustness of the conclusion, the answers were recorded. The quantitative data collected from the survey respondents and the qualitative data from the managers' interviews ensured validation of each other and formed a concrete basis for depicting the conclusions. The supporting quotes provided within the qualitative interview analysis section are grounded in the experiences of the managers from the travel agencies to ensure a meaningful and deeper relation to the AIN and AUE of chatbots in tourism. This aids to enhance both the relevance and validity of our contribution to the practitioners.

4.1 Research survey instrument design

The present studies of TAM and ANM were used to develop the measures of this work. These constructs' characterization from the operational definitions are adopted from the literature and modified: the PEA and PUL (Davis, 1989; Oh *et al.*, 2013), AIN (Kaushik *et al.*, 2015), AUE (Klopping and McKinney, 2004; Lin and Huang, 2008; Zhou *et al.*, 2010), ANM (Lu *et al.*, 2019; Bartneck *et al.*, 2009; Gursay *et al.*, 2019), PNT (Bartneck *et al.*, 2009), TXN (Meuter *et al.*, 2003; Evanschitzky *et al.*, 2015) and PTR (Roy *et al.*, 2001; Kaushik *et al.*, 2015). The construct measures were modified and updated considering the SMEs suggestions for travel planning chatbots.

4.2 Sampling and data collection

4.2.1 Phase 1. SMEs from the travel and tourism industry such as the Indian Association of Tour Operators, Ministry of Tourism, Department of Tourism and travel agency executives,

Table 1.
Measurement model
summary

Main construct	Indicator/item	Factor loading	Adapted from
PEA AVE = 0.728 CR = 0.901 α = 0.882	Chatbots for tourism requires little mental efforts to plan travel	0.811	Oh <i>et al.</i> (2013), Davis (1989), Kim <i>et al.</i> (2009)
	It is easy to use chatbots for tourism for my travel plan and booking	0.816	
	My interaction with chatbots for tourism is clear and understandable for planning my tours	0.839	
	Chatbots for tourism is simple to use for travel planning and booking	0.838	
	Chatbots for tourism are useful for my travel planning	0.821	Oh <i>et al.</i> (2013), Davis (1989), Kaushik <i>et al.</i> (2015), Kim <i>et al.</i> (2009)
	Chatbots for tourism improve the efficiency of my travel planning	0.862	
	Chatbots for tourism improve my performance of travel planning (save time)	0.833	
	Overall I feel that chatbots for tourism are very useful for travel planning	0.848	
	I might somehow face a problem when I use technology such as chatbots for tourism	0.872	Meuter <i>et al.</i> (2003), Evanschitzky <i>et al.</i> (2015)
	I am unable to keep a pace with new technological advances	0.866	
TNX AVE = 0.733 CR = 0.879 α = 0.813	Using technology such as chatbots for tourism is makes me anxious	0.863	
	Technology-related words are difficult to understand	0.868	
	I feel difficult to understand technology-related matters	0.839	
	I escape from the utilization of chatbot technology as it is not much familiar to me	0.864	
	I am apprehensive to use technology as I feel that I make mistakes while using technology which I cannot rectify	0.844	Roy <i>et al.</i> (2001), Ponte <i>et al.</i> (2015), Zhang <i>et al.</i> (2019)
	I feel that information about travel provided by chatbots for tourism is honest and authentic	0.859	
	I feel that chatbots for tourism have clarity of services provided and frank opinions which are reliable	0.862	
	I feel chatbots in tourism for travel planning are trustworthy	0.867	
	I feel that chatbots for tourism have the necessary ability to provide travel plan service	0.866	Lu <i>et al.</i> (2019), Bartneck <i>et al.</i> (2009), Gursoy <i>et al.</i> (2019)
	Chatbots for tourism have their own mind	0.855	
ANM AVE = 0.739 CR = 0.944 α = 0.873	Chatbots for tourism can experience emotions	0.869	
	I fell that chatbots for tourism are –inanimate: living	0.863	
	I fell chatbots for tourism are computer- animated: real	0.824	
	I feel that chatbots for tourism are competent	0.816	Bartneck <i>et al.</i> (2009), Tussyadiah (2016)
PNT AVE = 0.744 CR = 0.916 α = 0.835	I feel that chatbots for tourism are knowledgeable	0.850	
	I feel that chatbots for tourism are responsible	0.845	
	I feel that chatbots for tourism are intelligent	0.831	
	I feel that chatbots for tourism are sensible	0.875	Kaushik <i>et al.</i> (2015)
Chatbot AIN AVE = 0.772	I plan to use chatbots for tourism in the future for travel scheduling	0.842	

(continued)

Main construct	Indicator/item	Factor loading	Adapted from
CR = 0.946 $\alpha = 0.901$	I intend the usage of chatbots in tourism for future travel plan and book my travel plan	0.848	
	There is a possibility that I will suggest my friends to use chatbots for travel planning	0.854	
AUE	I regularly use chatbots for travel planning	0.816	Klopping and McKinney (2004), Lin and Huang (2008), Zhou <i>et al.</i> (2010)
AVE = 0.717	I use chatbots to book my travel plan	0.864	
CR = 0.921 $\alpha = 0.867$	I use chatbots for my travel suggestions and planning	0.823	
	I frequently use to chatbots for my tour planning	0.862	
STT	I would like to plan my travel through my agent	0.834	Lin (2007), Kim <i>et al.</i> (2016), Sivathanu (2019)
AVE = 0.713	always than chatbots for tourism		
CR = 0.923 $\alpha = 0.878$	I would ask my human travel planner to plan my travel often	0.822	
	I always prefer that my human travel planner plans my travel	0.863	

Notes: 1. Average variance extracted (AVE) = (summation of the square of the factor loadings)/{(summation of the square of the factor loadings) + (summation of the error variance)}. 2. (Square of the summation of the factor loadings)/{(square of the summation of the factor loadings) + (square of the summation of the error variance)}

Table 1.

managers and experts from yatra.com, makemytrip.com, expedia.com, ixigo.com and goibibo.com were requested to review the survey instrument adapted from literature. These SMEs were conveyed about the scope and objectives of the work in advance. The suggestions from these SMEs were incorporated into the questionnaire to confirm the face validity of the instrument for the survey. The pilot study was done using this questionnaire. To measure the operational constructs, a five-point Likert scale was used. The Cronbach's alpha test was conducted for pre-test (64 respondents) and pilot test (145 respondents). The survey was conducted at airports, railway stations, bus terminals and tourist locations by contacting travelers. These travelers were shown pamphlets, information brochures and videos on chatbots for tourism. The authors ensured that these respondents were using some type of technology for travel purposes. The final survey was done after the appropriate results in the pilot study were attained. The construct operationalization is shown in Table 1.

4.2.2 Phase 2. The collection of primary data was done with a structured questionnaire by surveying with respondents (Table 2) lasting over 10 months. The respondents were surveyed at the airports, railway stations, bus terminals and tourist places in the four western states of India: Maharashtra, Gujarat, Karnataka and Goa including the cities – Mumbai, Pune, Kolhapur, Panchgani, Mahabaleshwar, Lonavala, Ahmedabad, Gandhinagar, Surat, Vadodara, Rajkot, Bengaluru, Mysore, Coorg, Hampi and Panaji. The respondents who used any type of tourism technology or chatbots for tourism purposes were surveyed using the convenience sampling technique. The videos and pamphlets mentioning the benefits and usage of the tourism chatbots were shown to the respondents before the survey. These respondents, as shown in Table 2, were appropriate as they were educated, had substantial income and were using some kind of technology and chatbots for travel and tourism purposes. A total of 2,310 respondents in total were surveyed, out of

which 1,970 questionnaires were filled up and finally 1,480 completed questionnaires were thorough in all respects for final analysis. The rate of response was 60.90%.

4.2.3 Phase 3. The senior managers from the travel agencies who had more than 10 years of experience were chosen wherein chatbots are used or companies are planning to use chatbots. The data collection was a continuous process. After every interview, coding was done and the coding procedure is explained below. The theoretical saturation happened after the 36th manager’s interview, hence the interviews were stopped and the information about the demographics of these managers is provided in Table 3. Theoretical saturation happens during data collection, which means no new information, properties and concepts are developed, hence sampling is completed (Glaser and Strauss, 1967). The questions asked were:

- Q1. What are the reasons for which consumers are fond of chatbots for tourism purposes?
- Q2. Do you think ANM (human-like behavior) of chatbots is eliminating the human presence in travel assistance?
- Q3. Will chatbots replace human travel assistants?
- Q4. Do you observe that customers still prefer human tour assistance rather than chatbots?
- Q5. What were some remarkable events you observed related to chatbots?

The recording of the interviews was done with the permission of these managers and the anonymity of their identities was ensured. Qualitative and quantitative data provided validation to each other and established a strong foundation for the reliability of the

Table 2.
Demographic profile
(N = 1,480)

Demographic	Characteristics	No. of respondents	(%)
Gender	Female	651	44
	Male	829	56
Education	Below higher secondary	148	10
	Higher secondary	355	24
	Graduate	415	28
	Post graduate and above	562	38
	Usage of any kind of technology for tourism purpose		
	Less than 6 months	532	36
	6–12 months	607	41
	1 year and above	341	23

Table 3.
Manager’s
demographic profile

Demographic details	Characteristics	No. of respondents	(%)
Designation	Managing director	16	44
	Sales head	12	33
	Regional head	8	23
Gender	Male	24	67
	Female	12	33

conclusions of the research and the development of travel organization strategies. The quotes supporting the development of strategies at the organizational level are grounded in the manager's viewpoints and experiences as mentioned in the discussion section. The systematic analysis was done by transcribing the individual interviews completely. The data was appraised and coded.

The approach of two-step coding was considered in which the codes were mainly generated inductively from the interview data and accordingly approved by the SMEs and authors. Inter-rater reliability is ensured as both the authors alternatively worked as non-coder and coder in the overall coding procedure. To finalize the code, the coder author defined, cross-checked and discussed the coding separately. The record-keeping and judgment of the coding were done by the non-coder author. Where there was a disagreement on code or whenever required, the doubts were clarified from the passage of text coded. Alternatively, each of the authors judged the code generated. The SMEs were also consulted to cross-check the bias during the data analysis and coding process and to ensure coding validity. A total of 36 managers were interviewed as theoretical saturation (Saunders and Townsend, 2016) happened in the 36th interview. NVivo 8.0 software is used for data analysis to carry out text searches, count the instances, complete the coding and explore the code intersections.

4.3 Non-response bias

The *t*-test was done to analyze the difference in the response between the early wave (840) and late wave (540) respondent groups (Armstrong and Overton, 1977; Tsou and Hsu, 2015). The result ($p = 0.31$) proved that non-response bias is not a concern. Finally, the total responses found to be fit in all respects were 1,480.

4.4 Common method bias and endogeneity

After the single factor Harman test (Wang *et al.*, 2018; Podsakoff *et al.*, 2003), the variance of 28.32% was described by a single factor. Therefore, common method bias is not observed in this research. Recursivity in the structural model may cause endogeneity (Dubey *et al.*, 2018; Lai *et al.*, 2018). The variance in an exogenous variable may be endogenous to the model (Guide and Ketokivi, 2015) as the cross-sectional data may result in a misspecified model. Hence, a Ramsey regression equation error test was used (Lai *et al.*, 2018) and it confirmed that endogeneity was not an issue in the proposed model. Therefore, the validity and reliability of the measures were confirmed.

5. Data analysis and results

A total of 44% of female and 56% of male members were the respondents. The educational background of respondents was as follows: 10% below higher secondary, 24% higher secondary, 28% graduate and 38% were postgraduate and above. Of the respondents, 44% were using AI-based chatbots and 56% of respondents were using other advanced technology. The AI-based chatbots were used in travel and tourism agencies for travel planning and concierge, flight bookings, hotel bookings and real-time travel assistance. The chatbots used by the respondents were: Myra by MakeMyTrip, Ixibaba by ixigo, Gia by Goibibo, Expedia chatbot by Expedia and Yuva by yatra. The respondents using the technology of any type and chatbots for tourism purposes: 36% less than 6 months, 41% from 6 to 12 months and 23% are 1 year and above.

5.1 Measurement model

Partial least squares structural equation modeling (PLS-SEM) is widely used in social science research as it is appropriate for non-normal data and supports small as well as large sample sizes (Hair, et al., 2014, 2017). Therefore, the analysis of the conceptual model was done using PLS-SEM. The SmartPLS 2.0 software (Ringle, et al., 2005) was applied for primary data analysis. The measurement properties in the final model were calculated for the latent constructs, reflective in nature having multiple indicators.

As per Table 1, composite reliability (CR) values confirm the high level of reliability and internal consistency (Nunnally, 1978). The average variance extracted (AVE) values are greater than 0.5; hence, the convergent validity for all the constructs are established (Hair et al., 2017; Guadagnoli and Velicer, 1988). The comparison of the inter-correlations of the constructs with the AVE off-diagonal values revealed in Table 4 proves the discriminant validity. Discriminant validity between the constructs is verified (Fornell and Larcker, 1981), as the shared variance values were lower than the corresponding AVE.

5.2 Structural model

The measurement model was confirmed by ensuring the reliability and validity and the path analysis was done to scrutinize the association between the constructs using the structural model. In Table 5 and Figure 2, the path coefficients and *t*-values with the signification level are shown.

Table 4.
Discriminant validity

Construct	TXN	PEA	PUL	PTR	ANM	PNT	AIN	AUE	STT
PEA	0.853								
PUL	0.421	0.876							
TXN	0.310	0.472	0.856						
PTR	0.211	0.384	0.584	0.860					
ANM	0.206	0.314	0.324	0.621	0.859				
PNT	0.127	0.272	0.387	0.501	0.571	0.862			
AIN	0.982	0.187	0.172	0.237	0.548	0.442	0.878		
AUE	0.872	0.127	0.116	0.114	0.214	0.201	0.386	0.846	
STT	-0.142	-0.181	-0.194	-0.173	-0.163	-0.112	-0.247	-0.281	0.844

Table 5.
Testing of
hypothesis

Hypothesis	Hypothesis path	Path coefficient	<i>t</i> -statistics
H1	PEA → AIN	0.328	3.882***
H2	PUL → AIN	0.266	2.439**
H3	TXN → AIN	-0.139	1.108, NS
H4	PTR → AIN	0.264	2.766***
H5	ANM → AIN	0.256	3.389***
H6	PNT → AIN	0.269	2.378**
H7	AIN → ACU	0.489	3.697***
H8	AIN x STT → ACU	-0.270	2.585***

Note: *t*-values for two-tailed test: ****t*-values 2.58 (sig. level = 1%), **1.96 (sig. level = 5%) and **t*-values 1.65 (sig. level = 10%)
Source: Hair et al. (2017)

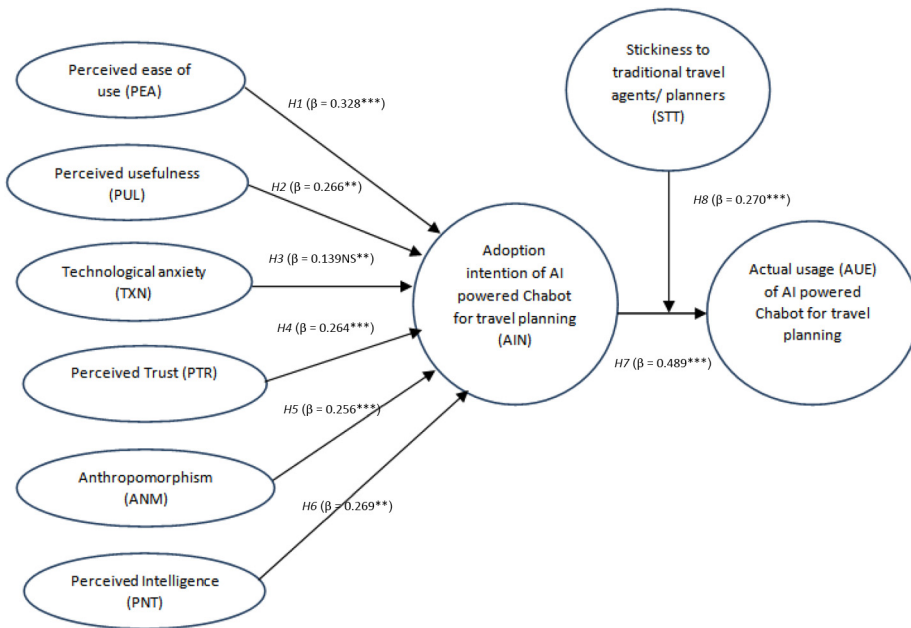


Figure 2.
Structural model

5.3 Structural model analysis

Table 5 reveals that PEA ($\beta = 0.328$) influences the AIN of chatbots for travel planning, hence *H1* is confirmed. It contradicts the study of tourism App adoption (Pan *et al.*, 2017). The PUL ($\beta = 0.266$) of travel planning chatbots influence the AIN (Kaushik, *et al.*, 2015; Luo, *et al.*, 2008) which supports *H2*.

TXN is considered as a barrier to AIN of new technology (Mani and Chouk, 2018); however, it is found that there is no significant association between TXN ($\beta = -0.139$) and AIN, hence *H3* is rejected. As many people are using new technology for tourism, hence TXN is not an issue. PTR ($\beta = 0.264$) affects the AIN of tourism chatbots (Kaushik *et al.*, 2015), which shows that travelers trust the chatbots for travel planning and it supports *H4*. ANM ($\beta = 0.256$) influences the AIN of chatbots for tourism (Sheehan, 2018) and it confirms *H5*. It shows that chatbots for tourism having human-like characteristics are well-acknowledged for the adoption for travel planning. PNT ($\beta = 0.269$) influences the AIN of chatbots in tourism (Stadler *et al.*, 2014), which discloses that intelligent travel planning by chatbots affects adoption and confirms *H6*. AIN ($\beta = 0.489$) of chatbots for tourism influence the AUE (Gupta *et al.*, 2017; Ghanem *et al.*, 2017), which confirms *H7*. Addressing *H8*, the moderating effect of stickiness to traditional travel planning and booking through a human travel agent on AUE of chatbots was examined using interaction effect in path analysis of structural equation modeling. STT shows the significant negative moderating effect ($\beta = -0.270$) between AIN and AUE which supports *H8*. This confirms that stickiness to traditional travel planning and booking through human agent act as an inhibitor to the AUE of chatbots and confirms the existing research (Hsu and Lin, 2016; Sivathanu, 2019; Lin, 2007).

5.4 Qualitative interview analysis

The findings are derived from the manager's interviews, which supported the external validity of the results with implications. It also confirms the commitment of managers toward using AI-based chatbots and mentions the issues faced by them. Managers are willing to use chatbots as they will save costs and will be able to provide better and faster services through chatbots. The results express how PEA, PUL, TXN, PTR, ANM, PNT and stickiness fostering visitors influence the intention to use and AUE of tourism chatbots.

The following quotes emerged after the analysis of interview data:

5.4.1 Usage of chatbots (perceived ease of use, perceived usefulness, perceived trust and perceived intelligence). The managers discussed that most of the customers have smartphones. Customers are becoming well acquainted with technology related to travel planning and booking. The number of customers who are using chatbots for travel planning is increasing and it is providing a boost to our business. Chatbot technology is helping travel agencies to complete travel-related tasks accurately and efficiently than their human counterparts. Using chatbots for travel planning is cost-effective for the agencies as there is no need to recruit human travel assistants. Travel agency executives and managers mentioned that customers have started feeling more comfortable and gradually adopting chatbots as they are easily accessible and provide travel-related information intelligently making the tours cost-effective. Managers also discussed that customers are amazed to see the accurate travel options and assistance provided by the AI-powered chatbots. The information provided by the chatbot is useful and trustworthy to plan the tour and fixing the travel itinerary for customers. The frequently mentioned quotes in this category are:

Chatbots are easily accessible to the customers and provide an intelligent travel plan. Customers are surprised to see the accurate and quick options provided by chatbots for their travel planning. It's very useful for travelers and slowly customers are trusting the chatbots for travel planning. It's cost-effective for us as it is reducing the manpower expenses. We feel that we should understand the detailed customer needs and customize the chatbot design as per the customers' expectations. Customers are slowly adopting chatbots due to its easy access and accurate travel planning assistance.

5.4.2 Issues with chatbots (technology anxiety and stickiness). Managers also mentioned that customers have complaints about chatbots. Some customers are not comfortable with the pace and language of the chatbots. Some customers prefer the mother tongue as a language of communication when they are planning their travel. Sometimes, even customers doubt the reliability of chatbots' suggestions; however, customers who are using them continuously trust the chatbots. Some customers enjoy coming to our travel office on weekends to understand the travel plan in details and they like to have personal assistance from traditional human travel assistants. They enjoy the care and personal attention provided by the traditional travel planners than the chatbots and they like to enjoy hospitality at the office. The manager also mentioned one critical incident when one customer did not understand the chatbots' instructions and visited the office and blasted on the frontline manager as he ended up booking the wrong date tickets. Managers pointed out that there are very few chatbot usage-related complaints. However, some customers feel more comfortable using human assistance as they have a traditional preference.

The quote in this category that was frequently discussed is as follows:

We feel that chatbots cannot completely replace human travel assistance as still some customers are hesitant to use chatbots and cope with the pace. Also, the network and internet connection to access and use the chatbots is at times again a problem. Some customers like the personal attention and flexibility provided to them by human travel assistants.

5.4.3 Anthropomorphism. The managers discussed that they are trying to get chatbots that can replace human travel assistants. Hence, chatbots must be perceived as human-like by customers. The managers mentioned that customers sometimes feel that travel assistants are chatting with them and at some point in time if they do not match up with the speed of the chatbot then they get irritated. Customers at times shout on chatbots when they face some difficulty in travel planning or during travel and they use slangs. At that point in time, chatbots cannot reply and pacify them. Chatbots generally are programmed in the English language which also creates problems for customers to feel the ANM of chatbots. Managers mentioned that customers do feel the ANM to some extent. In this category, the quotes discussed many times were:

Chatbots are like humans and customers also started perceiving the same. However, chatbots have limitations such as- sometimes customers cannot match up with the pace of the chatbot and also chatbots do not converse in the mother tongue of customers. We feel that it's good for us if the chatbots replace humans as we can provide better and faster service to customers using chatbots.

Overall, it was interesting to note that the data from the interviewed managers clearly expressed their commitment to using AI-based chatbots and issues faced by them. Managers are willing to use chatbots as they will save costs and will be able to provide better and faster services through chatbots. The interview data depicts how PEA, PUL, TXN, STT, PTR, ANM and PNT are fostering the visitors' intentions to use and AUE of chatbots in tourism. The quantitative data collected from the survey and the qualitative data from the managers' interviews provided validation of each other, confirming data triangulation.

6. Discussion and conclusions

6.1 Conclusions

This research explored the antecedents of adoption of chatbots for travel planning and its AUE. The travel planning chatbots are simple to use as they can be accessed from devices such as mobiles, laptops and desktops. Chatbots provide instant suggestions and real-time solutions for travel automation, which improve the efficiency of the travelers. Therefore, it is found that PEA and PUF influence the AIN which conforms with other tourism technology adoption studies (Luo, *et al.*, 2008; Luque-Martinez *et al.*, 2007; Kaushik, *et al.*, 2015). Even managers mentioned in the interview that customers are becoming tech-savvy; hence, customers are comfortable using chatbots for travel planning. Customers find chatbots easily accessible and can converse comfortably with them.

TXN may lead to the avoidance of the use of technology (Meuter *et al.*, 2005). However, the result contradicts and found that TXN does not influence the AIN of chatbots for tourism. The travelers are using different types of technology and customers are familiar with travel-related technologies. In the interview, managers feel that customers at times do not cope up with the pace of chatbots; hence, they end up using the assistance of humans from the agencies. This can be avoided by customizing the pace of chatbots as per the need of individual customers.

PTR affects the AIN of chatbots, which confirms that travelers feel that services provided by the chatbots are reliable, authentic and credible. Even travelers feel that chatbots provide trustworthy travel plans. Managers during the interview mentioned that customers trust the chatbots to some extent; however, they end up using human intervention in case of difficulties and emergencies.

Anthropomorphic characteristics of robots are studied in different research studies (Sheehan, 2018; Yu, 2020; Willemse and Wykowska, 2019; Zarouali *et al.*, 2018; Hughes *et al.*, 2015). This study confirms the positive impact of ANM on AIN of chatbots in tourism. Travelers feel that chatbots are real, living and have human-like characteristics to arrange travel plans. Managers' interview data reveals that customers do feel that chatbots are perceived as humans and have limitations such as: when customers are agitated, chatbots fail to respond, pacify and at times customers are uncomfortable, as chatbots are not communicating in the customer's native language.

PNT discusses that chatbots for tourism planning are intelligent, knowledgeable, sensible and reliable. These characteristics are inbuilt in chatbots because of AI. PNT affects the AIN of chatbots which reveals that chatbots can provide intelligent solutions that lead to AIN of chatbots. In the interview, managers mentioned that the results of chatbots' answers because of their intelligence and accurate assistance amaze customers.

AIN of chatbots affect the AUE of chatbots which is in line with existing studies (Gupta *et al.*, 2017; Ghanem *et al.*, 2017); however, this relationship is moderated by STT negatively. Though travelers have the intention to use travel-planning chatbots, however, STT to the traditional travel agents/planners still exist, as travelers are accustomed to using the traditional methods of travel planning.

In total, our research discusses the factors that influence the AIN of chatbots for tourism and its impact on AUE. Even this study understands the moderation effect of STT on the relationship between AIN and AUE of chatbots for tourism. The qualitative data from the interview of the managers mentioned that some travelers like personal attention; hence, they prefer human assistance for travel planning. They also like to share individual preferences with human travel assistants as they feel more comfortable than with chatbots.

Chatbots are in the course of acceptance by the customers and face limitations such as lack of communication in the mother tongue in conversations with chatbots and the pace of chatbots at times does not match with customers. More personalization and customization is required. Some customers still feel comfortable with personal travel assistance by human travel agents and prefer bespoke attention.

In this research, the authors throw light on user behavior regarding the adoption of chatbots for tourism using a mixed-method approach. The model proposed is based on the extant studies (Davis, 1989; Oh *et al.*, 2013; Lu *et al.*, 2019; Gursoy *et al.*, 2019; Kaushik *et al.*, 2015) to provide the predictors of AIN of chatbots for tourism. The proposed model is statistically validated as it adequately proves 63.2% of AIN of chatbots and 67.9% for AUE of chatbots in tourism. The predictors of AIN of chatbots are PEA, PUL, PTR, PNT and ANM. This study reveals the negative moderation effect of STT between AIN and AUE of chatbots. TXN has no influence on the AIN of chatbots which contradicts the existing studies (Evanschitzky *et al.*, 2015). The antecedents related to chatbots such as ANM, PTR and PNT are studied and found to have a positive influence on the AIN of chatbots. Finally, the proposed framework for the adoption of chatbots provides the predictors of chatbot adoption and the role of STT in adoption. The results from the quantitative data collected from the travelers provided empirical evidence about the antecedents of adoption and AUE of chatbots in tourism which was also reflected from the interviews of travel agency managers providing cross-validation of each other. This study is comprehensive as it establishes the reliability of the results by including the customers' and managers' perspectives.

6.2 Theoretical implications

The proposed theoretical model is for chatbots' adoption and usage, which is a disruptive tourism technology. The proposed model is derived from the extant literature (Kaushik *et al.*, 2015; Ghanem *et al.*, 2017; Sheehan, 2018; Bartneck *et al.*, 2007; Gallimore *et al.*, 2019; Zhang *et al.*, 2019; Evanschitzky *et al.*, 2015). This work responds to the call for further research and empirical studies on intelligent automation in the tourism sector by furnishing a conceptual model for the adoption of chatbots as currently there is a dearth of studies that explore the change in the ways tourism is performed because of the mediation of emerging technologies such as AI and robotics (Tussyadiah, 2020). It further bridges the gap in the present literature on the adoption of chatbot technology in tourism. This study takes a step forward in advancing the literature by providing key insights for the practitioners and scholars who want to study the travelers' behavior regarding the adoption of chatbots in tourism. This mixed-method work acknowledges the call by Denzin (2012) that suggested the lack of "triangulation" methodology studies in AI-based technologies especially in tourism, where the same phenomenon is studied and verified using combined methodologies.

The model provides the predictors of AIN of chatbots, which are PEA, PUF, PTR, ANM, PNT and TXN. It found that TXN is not a significant predictor. The ANM is studied previously in the adoption of robots and this study shows that ANM is a predictor of chatbot adoption. This contributes to the literature by empirically validating the application of uncanny valley theory in the context of chatbots. PTR and PNT showed a positive impact on the AIN of chatbots. This work empirically tested and validated the moderation effect of STT on the relation between AIN and AUE of chatbots providing a valuable contribution to the tourism domain literature. This study highlights the stickiness to traditional travel planning and arrangements through travel agents and its effect on the adoption of STT negatively moderates the relation of AIN of chatbots to AUE of chatbots in tourism. Scholars can use this model to study the various new advanced technology adoption behavior related to AI-based chatbots and robotics in tourism. This study highlights the role of stickiness to the traditional human travel assistance in the acceptance of chatbots among travelers.

6.3 Practical implications

This research provides critical insights for practitioners and managers by providing the factors of AIN of chatbots in tourism. This study highlights some of the manager's viewpoints, which can be considered to comprehend the adoption of chatbots in the tourism industry. Marketers and designers of tourism chatbots need to ensure that chatbots are easy and simple to use as well as useful in the tour planning and travel management. In consideration with H3, H4 and H5, developers of chatbots for tourism must ensure that chatbots provide reliable information and intelligently automate the tourism industry by providing real-time solutions. PTR is important for AIN of chatbots (Kaushik, *et al.*, 2015); hence, trust needs to be ensured by providing authentic service through chatbots for tourism. ANM is a predictor of AIN (Sheehan, 2018), therefore developers of chatbots also need to ensure that chatbots have anthropomorphic characteristics so that users feel that chatbots are real, living and human-like. Designers and developers can ensure that chatbots communicate in various languages which would provide a user-friendly interface to the customers. Though TXN (−0.139) did not influence AIN of chatbots for tourism, the practitioners need to ensure that chatbots do not create any anxiety related to the technology. The designers need to develop user-friendly chatbots so that technology anxiety can be eliminated from customers' minds.

It unfolds the critical role of STT in moderating the relationship between AIN and AUE of chatbots as per *H8*. Travelers are accustomed to revisiting the travel agents for travel planning because of their traditional practice of doing so. In the Indian context, travel agencies – Cox and Kings, Thomas Cook, SOTC, Kesari Tours and Club Mahindra – maintain a strong relationship with the consumers. The chatbot providers also need to ensure distinct and unique service features to offer delight for consumers to attract consumer usage. Online travel agencies such as yatra.com, expedia.com, goibibo.com, makemytrip.com and ixigo.com are extensively leveraging the usage of chatbots, hence the antecedents discussed in this research for the successful adoption of chatbots by consumers may be considered. The government tourism department needs to consider the predictors of AIN of chatbots in tourism for successful adoption. The marketers can benefit from this study as it provides mixed viewpoints of the customers as well as the managers to ensure that the findings of this study are valid.

The chatbots need to be programmed with customization and personalization as per customers' needs so that customers will be at ease while using chatbots for travel planning.

6.4 Limitations and future research

This is the first initiative to investigate the AIN and AUE of chatbots for tourism. The travel chatbot services are recently started by travel agencies. This study limits itself by studying the chatbots for the tourism sector. This is a cross-sectional study and it has geographic limitations too as it surveys the users of chatbots for tourism in India. Further, this AIN of chatbots can be extended to various developing countries and different sectors/industries. Future studies can understand the continuation intention of chatbots usage by users. The research can be performed to explore the issues faced by the service providers of chatbots while designing and developing the chatbots. This study provides insights for AIN and AUE of chatbots. However, further studies can be extended to include the antecedents such as customization, personalization, interactivity and perceived enjoyment, and understand its influence on the customer experience and perceived customer value. The study can be extended to understand the data quality provided by the chatbots as per the customers' requirements and its influence on customer satisfaction. Longitudinal studies can be conducted to generalize the outcome of this study.

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