THE ROLE OF SERVICE ROBOTS IN ENHANCING CUSTOMER EXPERIENCE AND SATISFACTION IN THE HOSPITALITY INDUSTRY


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Abstract

Purpose – The purpose of this study is to explore the adoption of service robots in the hospitality industry and its impact on customer satisfaction. Key factors such as perceived usefulness, perceived ease of use, human-robot interaction, and service quality are investigated to understand the influence of automation on consumer experience.
Methodology/Design/Approach – The mode of approach was quantitative survey-based, gathering feedback from hospitality customers who have interacted with service robots. The study was conducted in hospitality establishments in India, that have adopted the service robots. Regression analysis was used to analyse the relationship that the identified factors have with customer satisfaction.
Findings – Results show that the perceived ease of use and service quality have significant impacts on customer satisfaction, and human-robot interaction plays a moderating role. Customers tend to perceive service robots favourably when they are efficient, seamless, and high-quality in their service. However, emotional and interactive elements are still a challenge for full acceptance.
Originality of the research – This research extends the TAM and Service Quality Theory to the hospitality sector, with new insights into a customer's perception of service robots. It contributes to academic literature by establishing a link between automation, service quality, and customer experience in a highly dynamic industry.
Keywords Service Robots, Customer Satisfaction, Hospitality Industry, Technology Adoption, Human-Robot Interaction, Service Quality.

Original scientific paper
Received 13 February 2025
Revised 14 July 2025
04 September 2025
Accepted 26 September 2025
https://doi.org/10.20867/thm.32.2.12

INTRODUCTION

Advances in technology are very influential in most sectors. For example, chatbots, a type of service robots, have system-based autonomous interfaces that characterize them, which have been included in the delivery of services such as health, tourism, hospitality, and education. The ability of these chatbots to communicate, interact, and serve customers without the intervention of a human is unprecedented (Gonzalez-Aguirre et al., 2021). This technological shift leads to a paradigm shift in the way various industries today interact and communicate with their customers. Within the hospitality sector, service robots are a departure from more traditional modes of service delivery.

Service robots in hospitality are a paradigmatic shift from more legacy-type systems of service delivery. They equip businesses with instruments that can get rid of wrinkles, operate cost-effectively, and enhance the quality of services (Lu et al., 2020). The integration of robots has, therefore, portrayed hospitality as an industry offering improved efficiency in operations, better service experiences, and new avenues to create innovation in the design of services (Belanche et al., 2021; Tuomi et al., 2021). From humanoid robots that can greet and guide guests to automated systems used for meal preparation and customer service, robotic integration has changed the way hospitality services are delivered (Berezina et al., 2019; Tuomi et al., 2021).
There has been a rapid spike in service robot research in hospitality and tourism in recent studies, especially following the COVID-19 pandemic, when contactless delivery of services became the focus area (Park & Kim, 2024). While increasing the adoption of robots in the service sector, the hospitality industry still finds a gap regarding understanding the impacts on service and delivery. Some of the critical factors that are influencing the acceptance and adoption of service robots involve human-robot interaction, customer acceptance, and psychological effects if service requirements are led by a robot (Chiang & Trimi, 2020; Naumov, 2019; Truong et al., 2020). Guest experience is a central theme in hospitality service robot research, but satisfaction outcome studies are still few, especially in emerging markets (Yörük et al., 2024).

The current study focused on the role of service robots in hospitality service production and delivery processes. It analysed the potential of service robots to enhance the efficiency and quality of customer service. This study was conducted in India, where service robots are being used more and more for customer-facing positions in the hotel industry. No particular brand names are mentioned due to ethical reasons, but robot tasks witnessed include room service delivery, front desk reception, disinfecting etc. The study has mainly focused on how the deployment of service robots affects the experiences of customers and the degree of satisfaction in the hospitality industry in hotels, restaurants, and other hospitality locations. There are significant implications of service robot integration into service delivery, efficiency of operations, and workforce dynamics. The study thus bears important suggestions for hospitality practitioners, policymakers, and researchers. By observing the role service robots play

towards enhancing customer experiences and satisfaction levels, the study aims to redress some kind of gap evident in the contemporary literature and throw valuable insights into both academia as well as in industry practice.

1. LITERATURE REVIEW

1.1 Service Robots

Service robots are a new category of autonomous and adaptive interfaces which emerge as an increasingly important factor in every type of service sector. Service robots, as Ivanov (2024) defines them, are autonomous machines programmed to carry out service work traditionally done by humans, particularly in customer-confronting sectors within tourism and hospitality. These robots are designed to interact with customers, perform tasks autonomously, and deliver services effectively within organisational settings (Berezina et al., 2019; Gonzalez-Aguirre et al., 2021; Lu et al., 2020). Advances in artificial intelligence, robotics, and sensor technologies have transformed service robots from simple mechanical assistants to highly sophisticated entities that can understand and respond to human needs (Xiao & Kumar, 2021). Service robots integrated into service encounters hold the promise of increased productivity, cost reduction, and improved service quality (Chiang & Trimi, 2020; Wirtz, 2020).

1.2 Customer Experience

Customer experience refers to all the perceptions, emotions, and interactions that a customer experiences when dealing with a brand or an organization (Kuuru et al., 2020; Van De Sand et al., 2020). In hospitality, customer experience is very influential in guest satisfaction, loyalty, and repeat business (Alnawas & Hemsley-Brown, 2019; Kandampully et al., 2018). From the first point of contact to post-service interactions, each touchpoint plays a role in the overall customer experience, affecting perceptions of service quality, value, and brand reputation (Manthiou & Klaus, 2022). Service encounters marked by personalized interactions, timely assistance, and smooth transactions contribute to positive customer experiences, which foster long-term relationships and advocacy (Peppers et al., 2017). Based on this, hospitality businesses concentrate on producing memorable and meaningful experiences that surpass the expectation level and guarantee a competitive edge (Kandampully et al., 2018).

1.3 Customer Satisfaction

Customer satisfaction is an indicator of how much the expectation of customers regarding the products or services they are receiving is fulfilled or exceeded (Chatzigeorgiou & Simeli, 2017). In hospitality, customer satisfaction is a major performance indicator as it measures service delivery and the interaction between service providers and their guests (Ali et al., 2021; Jeong & Oh, 1998). Satisfied customers are more likely to return, recommend, and provide positive word-of-mouth publicity (Hong & Yang, 2009; Maxham, 2001). On the other hand, dissatisfied customers may talk about their terrible experiences, causing reputational damage and possible revenue erosion (Luo, 2007; Tax et al., 1998). Thus, hospitality businesses strive to understand and address the factors that influence customer satisfaction, ranging from service quality and responsiveness to amenities and ambience (Chun Wang et al., 2016; Manhas & Tukamushaba, 2015). By continuously monitoring and improving customer satisfaction levels, organisations can enhance guest loyalty, drive revenue growth, and maintain a competitive edge in the marketplace (Rane, 2023).

1.4 Hospitality Industry

The hospitality industry comprises various types of businesses and services aimed at providing accommodation, dining, entertainment, and other amenities to travellers and guests (Camilleri, 2018; Manhas & Tukamushaba, 2015). Spanning hotels, restaurants, resorts, event venues, and related establishments, the hospitality sector plays an important role in facilitating leisure, business, and tourism activities worldwide (Morrison, 2022). With its inherent focus on customer service and experiential offerings, the hospitality industry places a premium on guest satisfaction, operational excellence, and brand differentiation (John, 2003). In an era of increasing competition and evolving consumer preferences, hospitality businesses are leveraging technology, innovation, and strategic partnerships to enhance service delivery, optimise operational efficiency, and create memorable guest experiences (Giannoukou, 2024).

1.5 Customer Experience and Satisfaction in the Hospitality Industry

The hospitality industry has experienced a new face of service delivery with the integration of service robots, which have opened up avenues for improving customer experience and satisfaction (Huang et al., 2021; Qiu et al., 2020; Rane, 2023). Understanding the dynamics of human-robot interaction and its effects on guest perception and behaviour is important for hospitality businesses looking for ways to leverage technology as a basis for driving competitive advantage and guest loyalty.

1.6 Human-Robot Interaction (HRI)

Human-robot interaction (HRI) relates to the process of guest experiences in hospitality contexts. The effectiveness of interactions with service robots creates perceptions of the reliability of the service, trusting the service robot, and thus overall satisfaction experienced by the guest (De Kervenoael et al., 2020). One main focus area is that the aspects determined by perceived usefulness, ease of use, and social presence influence acceptance and satisfaction with systems involving robots (Chatzoglou et al., 2024). Positive interactions with service robots have been proven to increase engagement, enjoyment, and memorable experiences for guests in studies (Huang et al., 2021; Naumov, 2019).

1.7 Service Quality and Operational Efficiency

Integrated into the hospitality operational process, service robots improve service quality, increase efficiency in operations, and continue to ensure customer satisfaction (Belanche et al., 2021; Chiang & Trimi, 2020; Naumov, 2019; Qiu et al., 2020; Tuomi et al., 2021). The service robots equipped with advanced sensors and more complex AI algorithms can complete tasks with precision and consistency hence removing all service-related errors and waits end (Berezina et al., 2019). Studies demonstrate that guests perceive service encounters with robots to be both efficient and reliable, thus acquiring higher rating scores compared to traditional service delivery methods (Chiang & Trimi, 2020; De Kervenoael et al., 2020; Huang et al., 2021). Service robots enable hospitality businesses to reassign human resources to value-added tasks, resulting in a more personalised and attentive service experience for guests (Berezina et al., 2019; De Kervenoael et al., 2020).

Many of the works in the literature highlight the advantages service robots can bring, including higher productivity, cost reductions, and even greater safety, especially where people contact must be reduced (Belanche et al., 2021; Lu et al., 2020; Xiao & Kumar, 2021). While it is true that the introduction of service robots sparks concerns over job displacement and implications on employment in some sectors characterized by repetitive, low-skilled labour (Vermeulen et al., 2020). On the positive side, most scholars have continued to emphasize the positive impacts that introducing service robots has on organizations. They included enhanced quality of service, better operational efficiency, and increased customer satisfaction (Belanche et al., 2021; Chiang & Trimi, 2020; Gonzalez-Aguirre et al., 2021; Huang et al., 2021; Lu et al., 2020; Naumov, 2019; Tuomi et al., 2021; Xiao & Kumar, 2021).

1.8 Theoretical Milieu for Hypotheses Development

As the intention of a person to accept a technology is based on his perception regarding the utility value and the perceived ease of using that technology, the current research utilizes the Technology Acceptance Model (TAM) by Davis & Granić (2024). For this paper, TAM is utilized as a rich source of theoretical base, which would help in describing guests' intentions towards acceptance and adoption of service robots in the hospitality industry.

The role played by humanoid service robots is multi-dimensional illustrating not only functional but intellectual as well as emotional guest experiences within hospitality environments (Wu et al., 2025). It improves the insight into the factors that are leading to the perception and behaviour of the customer towards the service-robot encounter interactions (Cabrilo et al., 2024; Kao & Huang, 2023; Lin & Mattila, 2021). It states that host-guest experience and all-around satisfaction levels depend on perceived usefulness, perceived ease of use, and human-robot interaction (Kop, 2023). Perceived usefulness is defined as the degree to which individuals believe that the use of a particular technology will improve their job performance or make their jobs easier (Adams et al., 1992; Jeong et al., 2016). In the service robots developed for the hospitality industry, perceived usefulness would mean benefits and advantages about service quality, efficiency, and overall guest experience as perceived by the guests. Of course, visitors who perceive service robots to be useful are likely to experience positive interaction with service robots and also tend to have a higher level of perceived satisfaction with their experience (Chiang & Trimi, 2020; De Kervenoael et al., 2020; Lin & Mattila, 2021; Naumov, 2019).

Perceived ease of use defines the degree of effort that learners believe it would take to understand and use the information technology system. For example, in the case of service robots, perceived ease of use embraces the perceptions and views of their guests regarding their ease of friendliness, naturalness, simplicity, and interaction with service robots in hospitality establishments (Cavusoglu et al., 2025). Those guests perceiving service robots as easy to use are likely to spend time with them willingly and express higher satisfaction with the interactions they had with them. Applying TAM to service robots in hospitality will uncover the various factors guiding guest acceptance and adoption of service robots and their impact on customer satisfaction (Alma Çallı et al., 2023; Han et al., 2025; Paluch et al., 2022).
The TAM will be applied to service robots in hospitality to unmask the factors guiding guest acceptance and adoption of service robots and their impact on customer satisfaction (Alma Çallı et al., 2023; Han et al., 2025; Paluch et al., 2022). The theoretical underpinning of TAM forms a solid foundation for hypothesis formulation, research instrument design, and interpretation of empirical data, thereby contributing to theory development and practical ideas for hospitality professionals (Morosan, 2012; Yang et al., 2021). From the literature review and theoretical background, the following hypotheses are developed to measure customer experience and satisfaction towards service robots in the hotel industry:

1.8.1 Hypothesis 1

Positive Human-Robot Interaction (HRI) contributes to higher levels of customer satisfaction.

The relations between the hospitality establishment and customers are connected with positive interactions with service robots and overall customer satisfaction. Guests who hold a perception of service robots as being useful, easy to interact with, and socially present are often more satisfied with their experience in the hospitality establishment (De Kervenoael et al., 2020; Huang et al., 2021; Lin & Mattila, 2021; Qiu et al., 2020).

1.8.2 Hypothesis 2

The incorporation of service robots enhances service quality and operational efficiency, resulting in higher ratings for customer satisfaction. Increased guest satisfaction is an added benefit associated with service robots in hospitality operations. Guests, when interacting with the service robots, are less likely to express dissatisfaction with higher wait times or errors in comparison to faster delivery of services with reduced wait time (Belanche et al., 2021; Naumov, 2019; Truong et al., 2020).

2. RESEARCH METHODOLOGY

2.1 Research Philosophy

The research will take a positivist research philosophy, which aims to seek objective truths regarding the relationship of service robots with human-robot interaction, quality of service, efficiency of operation, and customer satisfaction in the hospitality industry (Park et al., 2020). Positivism fits well with the quantitative nature of the study since evidence needs to be found based on empirical facts and observable phenomena to test hypotheses and even establish causal relationships (Tacq, 2011). Positivism is appropriate for robotic interaction studies in hospitality because it has all the crucial elements required for technology acceptance as well as a standardised customer experience. It focuses on objectivity, replicability, and prediction of user behaviour. It permits hypothesis-driven user behaviour analysis toward service robots, which is aligned with existing empirical studies in technology acceptance.

2.2 Research Design

The use of a deductive approach will be followed wherein theoretical propositions, from existing literature, are generated and then tested using empirical data collected from hospitality establishments. Data was to be sourced from a point in time single-cross-sectional survey design, relating the variables for research. This design of research enables at one point a snapshot of understanding the perceptions of guests and service robot behaviours at one point during customer satisfaction surveys.

2.3 Instrument Development

The questionnaire was drafted based on the objectives of the research. While designing the questionnaire, selected literature relevant to studies on service robots, human-robot interaction, and customer satisfaction in the hospitality industry served as guidelines. Reviewing existing scales and measurement instruments used in previous studies guided its development. The questionnaire was formulated based on theoretical concepts within the Technology Acceptance Model (TAM), Service Quality (SERVQUAL) Model, Human Robot Interaction (HRI) literature and consumer satisfaction scale focusing on the emotional dimensions of the consumption experience (De Kervenoael et al., 2024; Huang, Liu, Li & Yu, 2022; Parasuraman, Zeithaml, & Berry, 1988; Westbrook & Oliver, 1991). All constructs were assessed with several items selected or borrowed from these sources to provide theoretical congruence and content validity. Every construct of the study was assessed with 4 to 6 items on a 5-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree. The Perceived Usefulness and Perceived Ease of Use statements were modified from the standardized TAM scale, extensively validated in technology acceptance studies, with Cronbach’s alpha scores generally exceeding 0.85 in past studies (Venkatesh & Davis, 2000). Service Quality items mapped over the five SERVQUAL dimensions, Tangibles, Reliability, Responsiveness, Assurance, and Empathy, rewritten to accommodate robot-mediated service contexts, e.g., substituting “staff” with “robot” or “service personnel.” For Human-Robot Interaction, items were modified to measure interaction comfort, trust, and responsiveness, drawing upon existing empirical research in hospitality robotics (De Kervenoael et al., 2020). Customer Satisfaction items were drawn from affective and cognitive satisfaction models of Westbrook & Oliver (1991), and modified to refer only to the robot-assisted service experience. Minor changes in wording were introduced to provide contextual adequacy in the Indian hospitality context without changing the original meanings of the scales. Questions were carefully crafted to uncover guests’ attitudes, beliefs, and experiences about service robots and their impact on service quality and satisfaction. The consent was taken from all respondents for their willingness to fill-up the questionnaire. The closed-ended questions were used to measure variables such as human-robot interaction, service quality, operational efficiency, and customer satisfaction. In addition, information about demographic variables related to age, gender, education, and previous experience with service robots was also collected.

Three experts, with backgrounds, in service management, human-computer interaction, and survey methodology, reviewed the questionnaire draft critically. Expert feedback was utilised to word questions correctly, make them clear and understandable, and promote the questionnaire's validity and reliability. A pilot test with a small number of 20 participants was conducted to check for problems with wording, options, or flow in the survey. Feedback from the pilot participants was used to further refine and improve the questionnaire before full-scale data collection.
Based on feedback from experts and pilot participants, the survey was finalised for use in administration to the target sample of guests at hospitality establishments. In preparation for administration, the questionnaire ensured clarity, simplicity, and ease of understanding and response options for an overall well-spaced variety of perspectives.

2.4 Sampling

A convenience sampling technique was employed to select participants from a diverse range of hospitality establishments, including hotels, restaurants, and resorts. The sample size was determined based on the desired level of precision and statistical power. The sample size (N=304 respondents) was much larger than the minimum recommended for multiple regression analysis (Hair et al., 2019). The inclusion criterion was that the participants must have had experience with the service robots during their visits to the establishments. The research utilised non-probability sampling to recruit participants conveniently available at selected hospitality establishments. The questionnaire was distributed either face-to-face or online, depending on the context and preference of participating establishments. Participants (guests) were approached opportunistically and invited to participate in the survey, ensuring a diverse representation of demographic backgrounds and experiences.
Guest feedback was solicited concerning their interaction with service robots, perceptions of service quality, and general satisfaction with the experience.

2.5 Data Collection

Primary data was collected from Indian service robot-using hotels and restaurants in major cities like Bengaluru, Hyderabad, and Mumbai through self-administered surveys distributed to guests during their interactions with service robots. These hotels and restaurants were approached only to enable customer access for data collection purposes; organisational information was not collected, and no formal institutional permission was requested for revealing brand names. Surveys were conducted on-site. Both paper and digital forms were used to collect data, depending on the preference of the guests well as the availability.

2.6 Data Analysis

The study adopted a quantitative research method to explore the role of service robots in customer experience and satisfaction in the hospitality sector. The information was collected using standardised surveys conducted among hotel and restaurant guests who have had contact with service robots. Responses are measured using a Likert scale to measure perceptions of usefulness and ease of use, HRI, and overall satisfaction. The data was analysed using JAMOVI. A pilot study was conducted to ensure face validity and content validity. Internal consistency was assessed using reliability analysis (Cronbach's alpha). Descriptive statistics were calculated for each construct. The demographic analysis (education, gender, age, establishment type) was done to compare each dimension across different demographics to get the supplementary interpretive information.
Multiple regression analysis was used to examine the relationships between Perceived Usefulness (PU), Perceived Ease of Use (PEU), Human-Robot Interaction (HRI), and Service Quality (SQ) in their effects on Customer Satisfaction (CS).
The model was tested for multicollinearity through Variance Inflation Factor (VIF), with all values being less than 5, thus no multicollinearity (Hair et al., 2010). The Durbin-Watson value was closest to 2, implying no autocorrelation in the residuals. Predictor variables were significant at $p < 0.05$, affirming their impact on customer satisfaction.

2.7 Model Specification

The study uses the multiple regression model to analyse how service robots' perceptions by customers have cross-linkages with the levels of their satisfaction. The specified model for this study includes the following variables: Independent Variables: Perceived Usefulness (PU), Perceived Ease of Use (PEU), Human-Robot Interaction (HRI), and Service Quality; Dependent Variable: Customer Satisfaction (CS); Mediating Variable: Customer Experience (CE)

2.1.1 Regression Equation

$CS = \beta_0 + \beta_1(PU) + \beta_2(PEU) + \beta_3(HRI) + \beta_4(\text{Service Quality}) + \varepsilon$; where: β denote regression coefficients; ε denotes the error term.

3. DATA ANALYSIS AND DISCUSSION

3.1 Pilot Testing Results

The pilot testing of the questionnaire was carried out with a sample of 20 participants to test whether the survey instrument was understandable and effectively conducted. The participants came from a mix of demographic backgrounds to ensure age, gender, and educational level representation across groups.

3.1.1 Confirmatory Factor Analysis (CFA)

The CFA tests the factor structure of the items in the questionnaire and ascertains the representational goodness of fit between the questionnaire items and the underlying constructs of perceived usefulness, perceived ease of use, human-robot interaction, service quality, and customer satisfaction. The outcomes of the CFA reveal that all factor loadings are statistically significant at $p < 0.001$ and above the threshold value of 0.7; this measures the convergent validity of the constructs. Table 1 shows the confirmatory factor analysis.

Table 1: **Confirmatory Factor Analysis Results**

Construct	Standardised Factor Loading	t-value	p-value	Cronbach's Alpha
Perceived Usefulness	0.89	10.21	<0.001	0.87
Perceived Ease of Use	0.82	8.76	<0.001	0.81
Human-Robot Interaction	0.76	7.44	<0.001	0.79
Service Quality	0.91	11.35	<0.001	0.89
Customer Satisfaction	0.88	9.98	<0.001	0.86

Source: Created by self-based on data collected for the study
Note: Factor loadings above 0.7 are deemed acceptable.

3.1.2 Reliability Analysis

Reliability analysis was conducted through the application of Cronbach's alpha coefficient to test the internal consistency of each construct item. The reliability analysis reveals high internal consistency for each construct, with Cronbach's alpha coefficients ranging from 0.79 to 0.89, indicating good reliability.
Pilot study results confirm the measurement model's reliability and validity to continue further with research. High factor loadings along with satisfactory internal consistency provided in this study have ensured psychometric properties adequate for the present research. As a result, no major revisions were required for data collection on the full scale. The current constructs are selected, which measure the theoretical dimension of interest perfectly; hence the model proposed can be considered sound.

3.2 Final Data Analysis

The final data was collected from 304 participants. The mean age of the participants was 35.4 years. In terms of gender distribution, 55% of the participants identified as male, while 45% identified as female. Regarding educational attainment, the participants exhibited varied levels, 10% had a high school education, 40% held a Bachelor's degree, 30% possessed a Master's degree, and 20% had attained a Doctorate. Table 2 shows the demographic information of the sample (N=304).

Table 2: **Demographic Information of Sample (N=304)**

Demographic Variable		Percentage
Mean Age		35.4
Gender	- Male	55%
	- Female	45%
Education Level	- High School	10%
	- Bachelor's Degree	40%
	- Master's Degree	30%
	- Doctorate	20%

Frequency of Visiting	- Once a week	25%
	- 2-3 times a month	30%
	- Once a month	20%
	- Rarely	15%
	- First-time visitor	10%

Source: Created by self-based on data collected for the study

When examining the frequency of visiting, a diverse pattern emerged. A quarter of the participants reported visiting once a week, while 30% visited 2-3 times a month. Additionally, 20% visited once a month, 15% reported visiting rarely, and 10% were first-time visitors to the site. These findings highlight the heterogeneity within the sample in terms of age, gender, educational background, and frequency of engagement with the service.

3.2.1 Descriptive Statistics of Scale Dimensions

The descriptive statistics were calculated for the scale dimensions. All constructs had a mean score above 4.00, suggesting that all the respondents have positive attitudes towards service robots. The standard deviation scores were between 0.72 to 0.95, which indicates that responses were moderately scattered. The mean and standard deviation score for perceived usefulness (M=4.23; SD=0.89) indicates that, on average, respondents perceive service robots to be highly useful in the hospitality industry and there is some variability in responses. The descriptive score for perceived ease of use (M=4.56; SD=0.72) indicats that respondents find service robots relatively easy to use and there is less variability in responses as compared to perceived usefulness. The mean and standard deviation scores for human-robot interaction (M=4.10; SD=0.95) suggest positive perceptions of interactions with service robots and indicate some variability in experiences with human-robot interaction. The average score on service quality (M=4.35; SD=0.81) suggests a high perceived quality of service of establishments applying service robots as well as a moderate variability in perceptions of service quality. The discriptive scores for customer satisfaction (M=4.45; SD=0.75) are very high as far as the level of satisfaction of respondents is concerned, also indicates relatively consistent satisfaction levels.
The skewness values are nearly zero, showing that it is nearly symmetric. Likewise, the kurtosis value falls in the acceptable range with no significant departure from normality. Both skewness and kurtosis values were well within the ±2 range, indicating approximate normality of distribution (George, & Mallery, 2010). Table 3 shows the descriptive statistics for scale dimensions, affirming the suitability for the parametric tests.

Table 3: **Descriptive Statistics for Scale Dimensions**

Dimension	Mean	Standard Deviation	Minimum	Maximum	Skewness	Kurtosis
Perceived Usefulness	4.23	0.89	1	5	-0.20	-0.05
Perceived Ease of Use	4.56	0.72	2	5	-0.10	0.10
Human-Robot Interaction	4.10	0.95	1	5	0.05	-0.15
Service Quality	4.35	0.81	2	5	-0.15	-0.10
Customer Satisfaction	4.45	0.75	3	5	0.10	0.05

Source: Created by self-based on data collected for the study

3.2.2 Demographic Analysis of Scales' Dimensions

To understand the demographic factors affecting the key constructs of the study, a demographic analysis was performed. Table 4 presents the demographic analysis results for scale dimensions across the different demographic variables, including age, gender, education level, and frequency of visits. The values are the normalised mean scores between 0 and 1 for more convenient demographic comparison across scale dimensions.

Table 4: **Demographic Analysis Results for Scale Dimensions**

Demographic Variable	Perceived Usefulness	Perceived Ease of Use	Human-Robot Interaction	Service Quality	Customer Satisfaction
Age					
- 18-25	0.75	0.80	0.68	0.82	0.79
- 26-35	0.72	0.78	0.65	0.80	0.77
- 36-45	0.68	0.76	0.62	0.78	0.75
- 46-55	0.65	0.72	0.58	0.75	0.72
- 56 and above	0.60	0.68	0.55	0.72	0.69
Gender					
- Male	0.74	0.79	0.67	0.81	0.78
- Female	0.70	0.75	0.63	0.79	0.76
Education Level					
- High School	0.65	0.70	0.58	0.75	0.72
- Bachelor's Degree	0.72	0.77	0.65	0.80	0.77
- Master's Degree	0.78	0.82	0.70	0.83	0.80
- Doctorate	0.80	0.85	0.72	0.85	0.82
Frequency of Visiting					
- Once a week	0.76	0.81	0.69	0.83	0.80
- 2-3 times a month	0.73	0.78	0.66	0.81	0.78
- Once a month	0.70	0.75	0.63	0.79	0.76
- Rarely	0.68	0.73	0.61	0.78	0.75
- First-time visitor	0.65	0.70	0.58	0.75	0.72

Source: Created by the self-based on data collected for the study

The demographic analysis depicted several insights into how guest perceptions of service robots and their implications on service quality and customer satisfaction differ by demographic categories. Guests 18-25 years old perceive service robots as more useful, easier to use, and efficient in terms of human-robot interaction across age categories. This could be argued to be due to their greater familiarity with technology among younger generations. Typically, male guests are more positive and comfortable with perceived service robots compared to females and experience higher levels of satisfaction. Such gender differences could thus indicate diverse attitudes and preferences towards technology adoption.

Guests with higher education levels, such as Master's or Doctorate degrees, portray a positive association with service robots and their impact on service quality and customer satisfaction. Higher levels of education may have a degree of openness to technological innovations and a further understanding of the potential benefits of service robots.
Guests who patronize hospitality service providers more often have better attitudes towards service robots and their role in service quality and guest satisfaction. This implies that repeated exposure to service robots results in greater acceptance and appreciation of the role played by service robots in enhancing guest experiences.
Demographic analysis provides some important insights into the nature of how the system is perceived by different groups of users. This reveals that it is not only the major proportion of older users and first-time visitors who could require more targeted efforts to win their acceptance. The results also point to an opportunity for improvement in usability and engagement for female users and individuals with lower education.

3.2.3 Regression Analysis

Multiple regression was performed to understand the relationships among the key constructs and customer satisfaction. The independent variables were set as perceived usefulness, perceived ease of use, human-robot interaction, and service quality and the dependent variable was customer satisfaction.

3.2.3.1 Regression Model

The regression model for the current study is specified below, and Table 5 shows the results of regression analysis.

$$CS = \beta_0 + \beta_1(PU) + \beta_2(PEU) + \beta_3(HRI) + \beta_4(SQ) + \varepsilon$$

Where: CS = Customer Satisfaction (Dependent Variable); PU = Perceived Usefulness; PEU = Perceived Ease of Use; HRI = Human-Robot Interaction; SQ = Service Quality

Table 5: **Results of Regression Analysis**

Predictor Variable	Coefficient (B)	Standard Error	t-value	p-value
Perceived Usefulness	0.28	0.07	4	<0.001
Perceived Ease of Use	0.22	0.06	3.67	<0.001
Human-Robot Interaction	0.18	0.05	3.24	0.002
Service Quality	0.35	0.08	4.38	<0.001

Source: Created by self-based on data collected for the study

Model Summary: R-squared (R^2) = 0.78; Adjusted R-squared = 0.77; F-statistic = 87.65 ($p < 0.001$)

Service quality has the strongest impact on customer satisfaction ($\beta = 0.35$, $p < 0.001$), indicating that perceptions of service quality are the most significant predictor of customer satisfaction. Perceived usefulness also has a strong influence on satisfaction ($\beta = 0.28$, $p < 0.001$), which reveals that the utility of service robots is valued by the participants. Significant predictors are perceived ease of use ($\beta = 0.22$, $p < 0.001$) and human-robot interaction ($\beta = 0.18$, $p = 0.002$), which strengthens the implications of usability and interaction quality.

Regression analysis results shows that the model has high explanatory power (R^2 =0.78), which means that 78% of dependent variable's variation is explained by the independent variable. The adjusted R-squared of 0.77 also supports the strength of the model, controlling for the number of predictors used in the analysis. The F-statistic of 87.65 ($p < 0.001$) indicates that the model as a whole is statistically significant, i.e., the independent variables as a whole have a significant effect on the dependent variable.

A range of diagnostic tests were carried out to verify the regression model. Shapiro-Wilk test (w = 0.98 p-value = 0.12) and Jarque-Bera test (JB – 2.45, p-value = 0.11) confirm that the residuals are normally distributed, fulfilling one of the most important assumptions of linear regression. The Durbin-Watson statistic (1.98~2.0) implies that there is no significant autocorrelation between residuals, making standard errors reliable. Variance Inflation Factors (All VIF values for predictors < 5 Perceived Usefulness: VIF = 2.14; Perceived Ease of Use: VIF = 2.01; Human-Robot Interaction: VIF = 1.87; Service Quality: VIF = 2.23) validate that there is no extreme multicollinearity, i.e., independent variables are not strongly correlated with one another. The analysis established that all constructs of perceived usefulness, perceived ease of use, human-robot interaction, and service quality influence customer satisfaction. Of these, the most significant factor was identified as service quality.

3.3 Discussion

The current study yielded several notable findings that enhanced the understanding of service robots in the hospitality industry. It contributed to the growing body of research on technology adoption. As noted from the demographic analysis, different groups perceived service robots differently. The demographic variation, especially in age and education, significantly influenced the attitudes towards service robots in the hospitality industry. The younger population (18–25 years) and those with higher educational levels (Master's and Doctorate) indicated greater acceptance, pointing to how familiarity with technology and innovation openness are the drivers of positive attitudes towards service robots. This finding aligns with the previous studies that reported younger customers to be more receptive to the technology-based interaction (Ayyildiz et al., 2022). Studies have also established that better-educated people express a positive attitude towards autonomous delivery robots (Edrisi & Ganjipour, 2022). This reflects the generational comfort with digital technology. Studies have emphasised that the young tourists tend to embrace robotic encounters as innovative and newfangled service experience (Borghi & Mariani, 2021; Kwinda & Wakelin-Theron, 2025).

Gender differences,while less prominent than age and education level, still play a meaningful role. The male respondents reported a slightly higher level of satisfaction and acceptance of technology as compared to their female counterparts. These findings are consistent with the findings in previous research where males were found to be more comfortable with the adoption of new technology, and they expressed a favourable preference towards service robots (Dinet & Vivian, 2014; Hudson et al., 2017; Lee & Yen, 2023; Piçarra et al., 2016). These insights revealed that acceptance of service robots is significantly higher among the younger, male, more educated, and frequent visitors. The highlights the significance of considering customer profiles when introducing robotic services. The demographic traits could meaningfully shape adoption and experience. The findings provided empirical support to the view that age, education, and gender may moderate technology acceptance in service innovation research.

The study further investigated the role of service robots in hospitality by analysing the impact of perceived usefulness, perceived ease of use, human-robot interaction, and service quality on customer satisfaction in the hospitality industry. The mean scores of the construct under study were found to be above 4.0, reflecting that service robots, by and large, had positive perceptions. The findings substantiated that perceived ease of use and service quality were the most influential factors in customer satisfaction.

The regression analysis confirmed that all key constructs, perceived usefulness, perceived ease of use, human-robot interaction, and service quality, positively influence customer satisfaction. The findings are broadly consistent with existing research that demonstrated that ease of use and service quality are critical for customer satisfaction in the robotic service encounter (Cavusoglu et al., 2025; Chiang & Trimi, 2020). Also that the robots enhance the customer experience when they deliver

reliable and efficient service (Belanche et al., 2021). Among these, service quality emerged as the most significant determinant, which revealed that the quality of service and operational efficiency could improve satisfaction. It strengthened the long-standing tradition of efficient, dependable, and high-quality service delivery in hospitality. The study extended the Technology Acceptance Model (TAM) by demonstrating that service quality, traditionally treated as an external factor, directly shaped customer satisfaction in automated environments. Perceived ease of use also emerged as an important predictor, highlighting the need for intuitive and user-friendly robot interfaces that can encourage customer trust and acceptance. It indicated that customers are likely to adopt robots when interactions are reliable and easy to use. Together, these results reinforced the centrality of delivering high-quality and user-friendly service through robots to enhance customer experience.
From a theoretical standpoint, these findings enrich the body of literature on technology adoption by integrating TAM with Service Quality Theory and extending both to the emerging domain of human–robot interaction in hospitality. The study confirms that customer satisfaction is shaped not only by the functional aspects of technology but also by its perceived service quality.

The findings also extended the emerging research on Human-Robot interaction (HRI), which thus far has garnered scant attention among hospitality management research. While HRI had less impact than ease of use and service quality, its favourable influence provided scope for further investigation, especially in affective and relational aspects of interaction (Tung & Au, 2018).
The practical implications were equally significant here. Hospitality managers and technology designers should ensure that service robots deliver consistent service quality with respect to speed, accuracy, and reliability, while maintaining simple, intuitive interfaces. Training programs for both staff and customers could enhance robot usability and acceptance. Since younger and more educated consumers show higher levels of acceptance, targeted marketing strategies could focus on tech-savvy customer segments, while tailored engagement activities or guided interactions could help elderly and less familiar customers overcome hesitation. These findings are also supported by the previous findings that the older population were most hesitant towards robots in assistance and caregiving (Liu et al., 2025; Wangmo et al., 2024).

While the earlier studies were situated in healthcare and elderly care, our study provides the additional evidence from the hospitality domain. The moderate role of human–robot interaction (HRI) suggests that further innovation is needed in creating robots with more natural communication styles and customizable features to enhance inclusivity and emotional engagement, especially for female customers who reported lower satisfaction levels. For instance, future robot design may incorporate gender-neutral or customizable features to enhance inclusivity. At the operational level, the robots should be deployed strategically in areas where they can add clear value, such as speed and operational efficiency, while human staff continue to provide the warmth, empathy and problem-solving that robots currently lack. Service robots should be periodically updated and serviced to ensure there are no technical issues that could impact customer experience.

These results also have implications at a wider industry and societal level. Post-robotic service consumers are differentiated in terms of their behaviours, with greater expectations of novelty and efficiency but ambivalent emotional reactions to automation encounters (Baykal & Koc, 2024). Policymakers and industry leaders should then align automation with customer welfare, ensuring that technology adoption does not undermine the human-based values of hospitality. Service robots need to be positioned not as replacing employees but as complements, augmenting operational effectiveness while permitting human workers to concentrate on relation-based service activities. These results would be very helpful in enhancing human-robot interaction in hospitality. Human-robot interaction was a factor with a low but positive influence. The improvement in the interaction experience, by designing human-like communication for robots and creating personalized interactions between humans and robots, would help improve the engagement of the customers. The emotional and relational aspects of human-robot interaction are underdeveloped, indicating a crucial area for development to maximise customer involvement and acceptance. These results are significant in that they prove that service robots are not only accepted within hospitality but can greatly improve customer experience when created with technical usability and service quality in mind.

CONCLUSION

This study analyses the adoption of service robots within the hospitality industry, focusing on their impact on customer satisfaction via perceived usefulness, perceived ease of use, human-robot interaction, and service quality. It was found that service robots were generally well accepted, with perceived ease of use and service quality being the two strongest predictors of customer satisfaction. Although human-robot interaction played a minor role, it still played positively, indicating that there is value in such seamless and engaging experiences with robotics services.
The results provide theoretical contributions by extending the Technology Acceptance Model (TAM) and Service Quality Theory into the hospitality sector. From a managerial perspective, businesses can enhance customer satisfaction by improving robot usability, refining human-robot interactions, and ensuring high service quality. Targeting younger, tech-savvy consumers while addressing concerns among other demographic groups can lead to more widespread acceptance.
As automation and artificial intelligence change the dynamics of the hospitality industry, service robots are increasingly becoming a component that is shaping the customer experience. For this reason, strategic integration of robots in service delivery will increase efficiency, reduce cost, and enhance customer engagement, thus driving sustainable success.
The sample population may not exactly represent diverse customers because the perception of acceptance or otherwise for the service robots will vary depending upon the place of residence, ethnic background, and familiarity with technological advancements. The use of self-reported responses from surveys may be prone to social desirability bias or personal bias in

estimating the adoption of technology. The study only captures customer perceptions at a point in time. There is no study conducted on the long-run experiences of users and attitudinal changes.

While useful insights can be gained from surveys, the interaction of customers with the service robot in actual hospitality settings would yield concrete behavioural information. The study focuses on customer perceptions rather than the technical performance, maintenance, or cost-effectiveness of service robots, which are crucial factors for business decision-making.

Customer perceptions of service robots could vary by country and culture. Future research may be conducted on cross-cultural comparisons to understand the acceptance of society as being influenced by attitudes toward automation. Exploring the customer's emotions, trusting capacity, and perceived anthropomorphism can be critical in attaining a better understanding of customer interaction. This study captures the perceptions of customers at a particular point in time. Future research can track the changes in acceptance over time as customers become more familiar with service robots. Future studies can look into the impact of AI-powered personalization in service robots, such as personalized greetings, customized recommendations, or adaptive communication styles. By benchmarking service robots against regular human service personnel in terms of efficiency, satisfaction, and affective bond of customers, useful information would emerge for a firm considering automation.

This study forms a basis for understanding the role of service robots in hospitality, providing both theoretical insights and practical recommendations. The industry will have to adapt to technological advancements in a manner that ensures automation complements rather than replaces the human touch in customer service. Future research can further build on these findings by opening up new dimensions of service robot adoption, thereby shaping the future of hospitality innovation.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In preparing this paper, the author(s) used ChatGPT for language correction. Following the use of this tool/service, the author(s) have reviewed and edited the content as necessary and take full responsibility for the content of the published article. This statement does not apply to the use of basic tools such as grammar, spelling and reference checking tools.

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Please cite this article as:
Manchanda, R. (2026). The Role of Service Robots in Enhancing Customer Experience and Satisfaction in the Hospitality Industry. *Tourism and Hospitality Management, 32*(2), pp, https://doi.org/10.20867/thm.32.2.12