





# Users Versus Non-users: The Impact of Experience on Hotel Guests' Attitudes Towards Service Robots in Hotels

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**Abstract.** The use of robotics and artificial intelligence have created a shift in the ways the service-based hospitality and tourism industry can fulfill the needs and wants of consumers that were earlier fulfilled only by humans. Robots have added the automation and self-service experience that play a vital role in the improvements of efficiency, speed, and the overall experience for the guests using technology. While there are many benefits of using robots in the industry, there are also risks associated with the excessive usage of robots on guest experience. As a result of the pros and cons on the topic, it is very important to gather data and analyze the results to further investigate and understand what the outcomes will be for the industry, its employees, and its customers. The purpose of this study is to examine the perceptions of the use of robots in the hotels as perceived by hotel guests who used a service robot and who did not. A self-administered survey was developed, and 939 usable responses were collected from hotel guests. Factor analysis showed that five factors emerged in the study: Advantages, Attitudes, Disadvantages, Pandemic Related, and Fear. Guests recognize the opportunities that service robots are bringing to their experience while voicing their concerns and fears about the use of them. Findings also showed that there are significant differences between users and non-users.

**Keywords:** Service robots · Guest experience · Artificial intelligence · Customer service

## 1 Introduction

Service robots have been introduced to healthcare, manufacturing, business, and hospitality that are shifting how services are performed. According to Robotics Tomorrow, an online robotics trade magazine, by 2021 the professional service robotic market is predicted to reach \$37 billion as industries are automating many processes for efficiency and productivity. The purpose of adding these kinds of robots to the hospitality industry is to automate time-consuming and repetitive tasks to accomplish more intellectual functions. The current and future adoption of technological innovations on service automation in hotels, restaurants, airports etc. is being used today yet, there are

many factors still to be discovered about their use and guest attitudes (Ivanov et al. 2017). The purpose of this study is to examine the attitudes of the hotel guests the use of service robots in the hotels. The second purpose is to determine if the perceptions differ between the guests who have experienced a service robot versus not. The overall objective of this study was to gain knowledge of how customers of the hospitality industry feel about service robots and to further understand their attitudes towards service robots in hotels. In addition, the study aims to suggest a scale for the dimensions for guests' attitudes for service robots in hotels.

## 2 Review of Literature

The newest and most advanced out of all is the addition of service robot usage in the hospitality and tourism industry. Service robots' use ranges from the basic artificially intelligent chatting robots to assist with the service process to complex robot assistants to improve guests' experience. As the number of businesses using service robots grow, it is important to understand what they will bring to the business in relation to the business itself and its customers (Belanche et al. 2020). Robotic automation's rapid growth emerges as software systems use automation, easy process of routine tasks, structured data, and analysis of internal systems that are directly compared with human activities (Aguirre and Rodriguez 2017). The impacts of robotics on businesses and the economy have created tremendous and unstoppable changes with the new way of taking on business opportunities and challenges with using service robots (Dirican 2015). Service robots are automating and changing the current hospitality industry with their advanced technological innovations (Tuomi et al. 2020). The use of robots in hospitality facilities creates a competitive advantage for the companies in the future due to its changing consumer markets and technology growth (Ivanov and Webster 2017). Robots are comprised of different complexity functions and ranges of service which are significant to this service-based industry as the interactions and essential activities of robots differ (Murphy et al. n.d.). For service organizations, it is important to recognize and understand what role robots will play and how it will affect the business, its and customers to ensure satisfaction for all during this emerging trend (Lukanova and Ilieva 2019). Hospitality consumers' acceptance on artificial intelligence provides a more user-friendly system with interactive technology and applicability to the hospitality industry business model (Go et al. 2020). The concept of service robots has been applied into hotel, food and beverage, and meeting and convention segments impacting the corporations, workforce, and customers with its current applications and future trends (Yang et al. 2020). The growing implementation of service robots in hotels provides a unique customer experience like nowhere else by combining human contact and artificial intelligence into one element (Fuentes-Moraleda et al. 2020). Service robots' usage in hotels is reviewed on their performance, process, purpose, trust, and intention with the highest importance for high service performance (Park 2020). Service robots serve as a tool to improve the quality of service offered to travelers as they give an extra reason to comeback to visit for the usage of the advanced technology systems in this fast pace growing technology era (Çakar and Aykol 2020). Similarly, Lee et al. (2021) determined that hotel guests expect high level of technical

performance and facilitation conditions. Furthermore, the analysis of innovativeness and optimism of technology readiness serve as critical factors in smart hotels as guests enjoy the performance of the robots, their services, and how this technology creates a positive experience for them during their stay (Kim et al. 2020). With the COVID-19 pandemic strategies to flatten the curve many drastic and quick changes have been introduced such as lockdowns, social distancing, stay-at-home orders, travel restrictions which impacted the hospitality industry as a whole. However, the usage of service robots in the hospitality industry serves as a critical factor to both physical and psychological factors of acceptance of the device and its service delivery (Gursoy and Chi 2020). During the COVID-19 pandemic, the service robot usage in hotels has created a positive attitude and responsiveness from customers in comparison to results prior to the pandemic as the fear of human contact and social distancing grew (Kim et al. 2021; Wu et al. 2021). With the increased presence to help manage the spread of COVID-19 and reducing the spread, service robots are able to perform tasks of delivery, sanitization, safety, and security by using their artificial intelligence programming and functions (Zeng et al. 2020).

## 2.1 Users Versus Non-users

The attitudes of customers that used a technology versus customers that did not is a subject of many studies (Chakiso 2019; Izquierdo-Yusta et al. 2015; Seo and Bernsen 2016; Sohail and Al-Jabri 2014; Verkasalo et al. 2010). Sohail and Al-Jabri (2014) investigated the attitudes towards mobile banking between users and non-users. The study found that six out of the seven factors were significantly different between users and non-users. Chakiso (2019) also determined that four out of the five factors that affect attitudes towards mobile banking were significantly different between users and non-users. On the other hand, Verkasalo et al. (2010) investigated how attitudes differ towards smartphone applications between users and non-users. They determined that users have more positive attitudes. Based on the review of literature, we propose the following hypothesis: H: There is a significant difference in hotel guests' attitudes towards service robots between users and non-users.

## 3 Methodology

### 3.1 Sample and Data

The data for this study was collected with a self-administered online survey using Amazon mTurk, with the total of 1152 responses from hotel guests. The use of mTurk is common in hospitality and tourism technology research (Ali et al. 2021, 2018; Birinci et al. 2018; Esfahani and Ozturk 2019; Nanu et al. 2020; Neto et al. 2020). Researchers should use several techniques to ensure that the responses from MTurk are valid (Cobanoglu et al. 2021). These include asking the same question in the survey twice and comparing the results (i. e. asking the age of the respondent in the beginning of the survey and the date of birth at the end of the survey) and removing the ones that do not match. Out of 1152 responses, 939 usable data was analyzed.

### 3.2 Factor Analysis

The respondents were asked to evaluate the statements about service robots on a 5-point scale (1 = Strongly disagree, 5 = Strongly agree). Before applying the factor analysis, reverse coding was applied when necessary. The statements in the survey were adopted from different academic studies (Bowen and Morosan 2018; Chan and Tung 2019; Chun-Min et al. 2017; Ivanov et al. 2018; Kabadayi et al. 2019; Kattara and El-Said 2013; Papathanassis 2017; Solnet et al. 2019; Sun Tung and Au 2018; Chen et al. 2019; Tussyadiah et al. 2020; Van Pinxteren et al. 2019) except for statements related coronavirus pandemic. Five statements about service robots in pandemic era were created from industrial articles (Frankel 2020; Hultgren 2020; Kahn 2020; Murphy et al. 2020; Reddick 2020; Simon 2020). Reliability measures for the items are presented in Table 1. Overall reliability for 35 items was found as 0.912.

Exploratory factor analysis results are presented in Table 2. Varimax rotation with Kaiser Normalization was applied and two items that have factor loadings lower than 0.40 have been removed. 34 items out of 35 divided into five factors that explains 55.230% of the total variance.

**Table 1.** Reliability measures

	Scale mean if item deleted	Scale variance if Item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Robots may learn similarly to humans allowing better contact	133.97	261.956	0.623	0.907
Robots may be functional	133.56	267.732	0.563	0.908
Robots may be reliable	133.67	267.370	0.567	0.908
Robots may answer basic questions	133.63	267.150	0.546	0.908
Robots may be convenient	133.56	268.145	0.567	0.908
Robots may be a resource of knowledge and information	133.63	266.373	0.614	0.908
Human-robot interactions may be more efficient	133.97	264.708	0.585	0.908
Robots may communicate with guests on basic services	133.58	268.206	0.570	0.908
Robots may track guest data for specialized information	133.66	267.734	0.571	0.908
Robots may reduce any miscommunication	134.14	262.146	0.579	0.908
Robots may reduce the time and resources for basic services and requests	133.74	266.308	0.585	0.908

(continued)

**Table 1.** (continued)

	Scale mean if item deleted	Scale variance if Item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Robots may save money while working non-stop	133.66	266.46	0.576	0.908
Robots may have skills of advanced recognition and communication	133.88	264.753	0.599	0.908
Robots may prevent customer language barrier	133.71	266.367	0.553	0.908
Robots may fulfill front line job functions	133.85	265.931	0.578	0.908
Robots may sell and upsell services and products to customers at the facility	133.91	265.331	0.559	0.908
Robot innovations may drive technology and business-based customers	133.72	265.667	0.619	0.908
Being served by a robot may create a safe and healthy environment	133.91	266.178	0.594	0.908
Robots may reduce the spread of the virus	133.74	265.206	0.572	0.908
Robots may perform the basic functions in facilities	133.69	266.824	0.615	0.908
Robots may be safe for our environment	133.74	265.794	0.575	0.908
Robots may allow for multiple language features	133.48	269.365	0.504	0.909
Robots may not need to be managed by men-power	134.05	265.550	0.497	0.909
Robots may be both automated and efficient	133.73	269.479	0.559	0.909
Robots may express emotions and gestures similarly to humans	134.36	262.579	0.504	0.909
Robots may replace human interactions	134.24	263.526	0.581	0.909
Robots may be easy to clean and maintain	133.77	267.354	0.522	0.909
Being served by a robot may be a scary experience	134.78	262.207	0.408	0.910

(continued)

**Table 1.** (continued)

	Scale mean if item deleted	Scale variance if Item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Robots may be limited to what they can do	134.57	267.210	0.393	0.910
Robots may not be helpful	133.42	272.810	0.388	0.911
Robots may show concern of too much technology usage	133.73	274.391	0.351	0.911
Robots may not have emotions or fear about the pandemic	133.51	273.274	0.340	0.911
Robots may replace human jobs	133.89	272.143	0.222	0.912
It may be risky to delegate responsibility to machines	133.55	275.369	0.231	0.912
Robots may be an expensive machine	133.57	276.263	0.237	0.912

**Table 2.** Exploratory factor analysis

Advantages	% of variance = 31.631			
Service robots may communicate with guests on basic services	0.736			
Service robots may allow for multiple language features	0.714			
Service robots may be functional	0.698			
Service robots may answer basic questions	0.685			
Service robots may be both automated and efficient	0.642			
Service robots may track guest data for specialized information	0.637			
Service robots may perform the basic functions in facilities	0.631			
Service robots may be convenient	0.613			
Service robots may save money while working non-stop	0.609			
Service robots may prevent customer language barrier	0.598			
Service robots may be a resource of knowledge and information	0.587			
Service robots may be reliable	0.564			
Service robots may reduce the time and resources for basic services and requests	0.486			
Service robot innovations may drive technology and business-based customers	0.447			

(continued)

**Table 2.** (continued)

Advantages	% of variance = 31.631			
Attitudes	% of variance = 10.083			
Service robots may express emotions and gestures similarly to humans	0.753			
Service robots may learn similarly to humans allowing better contact	0.689			
Human-robot interactions may be more efficient	0.635			
Service robots may sell and upsell services and products to customers at the facility	0.621			
Service robots may reduce any miscommunication	0.620			
Service robots may have skills of advanced recognition and communication	0.582			
Service robots may fulfill front line job functions	0.494			
Service robots may not need to be managed by men-power	0.437			
Disadvantages	% of variance = 6.506			
It may be risky to delegate responsibility to machines		0.789		
Service robots may not be helpful		0.772		
Being served by a service robot may be a scary experience		0.743		
Service robots may show concern of too much technology usage		0.692		
Service robots may be limited to what they can do		0.548		
Service robots may be an expensive machine		0.445		
Pandemic related	% of variance = 3.053			
Service robots may be easy to clean and maintain			0.668	
Service robots may be safe for our environment			0.630	
Service robots may reduce the spread of the virus			0.581	
Being served by a service robot may create a safe and healthy environment			0.484	
Fear	% of variance = 2.957			
Service robots may replace human jobs				0.818
Service robots may replace human interactions				0.717
KMO 0.948				

The first factor was named as *Advantages* that contains 14 statements related to possible advantages of service robots. The second factor was named as *Attitudes* that includes eight statements about respondents' attitudes towards service robots. The third factor was named as *Disadvantages* that contains six statements related to possible disadvantages of service robots. The fourth factor was named as *Pandemic Related* that has four statements related to service robots' usage during coronavirus pandemic. The last factor was named as *Fear* that contains two statements about fear towards service robots.

### 3.3 Hypothesis Testing: The Impact of Utilization of Service Robots on Guests' Attitudes.

An independent t test was conducted on the factor obtained in the study between the guests who have used or seen a service robot in a hotel versus not. Table 3 shows except for advantages of services robots, all other factors differ between these two groups.

**Table 3.** Independent sample t test

	Experience with service robot	n	Mean	sd	t	F	p
Advantages	Yes	593	4.17	0.630	1.550	9.778	0.122
	No	346	4.11	0.502			
Attitudes	Yes	593	3.63	0.771	-8.992	33.914	0.000
	No	346	4.02	0.560			
Disadvantages	Yes	593	3.36	0.787	-13.830	30.441	0.000
	No	346	3.98	0.588			
Pandemic Related	Yes	593	3.91	0.768	-5.512	34.977	0.000
	No	346	4.15	0.539			
Fear	Yes	593	3.62	1.004	-7.983	46.498	0.000
	No	346	4.07	0.714			

Table 3 shows that guests who have experience with a service robot or have seen one, have lower level of fear (mean = 3.62) versus guests who have zero experience (mean = 4.07). On the other hand, guests who have not used or seen a service robot have more positive attitudes towards service robots (mean = 4.02) and think more positively about service robots' advantages in the pandemic era (mean = 4.15). Additionally, the guests who have used or seen a service robot think more positively about robots' disadvantages (mean = 3.36). Finally, there is no difference between two groups regarding the advantages of the service robots.

## 4 Conclusion

With the purpose of this study being to identify and examine perceptions of the use of robots in hotels as perceived by hotel guests, the conclusion has resulted in positive attitudes and perceptions towards the use of robots in the hospitality industry. The data gathered and analyzed was separated into 5 categories on a scale from one strongly disagree to five strongly agree. The five categories included: advantages, attitudes, disadvantages, pandemic related, and fear. As the data and results show, the advantages of using robots for a reliable and functional addition to guest experience scored the highest along with the pandemic use of robots for safety and cleanliness which has



created a new impact on the industry. The attitudes on robots were positive with a few negative aspects of unknowingness of what robots can do and how that will sift the industry. The disadvantages of robots exemplified the worry of the limited functions and services robots can perform and that worry of too much technology usage. Following the disadvantages of robots, fear of job replacement and lack of human interactions were a negative aspect as well. According to the independent sample t test results, the guests who have direct or indirect experience with a service robot more negative attitudes and more negative opinions about usage a robot in pandemic era but think more positively about service robots' disadvantages. Choi et al. (2020) also argued why the hotel guests continually show strong resistance to receive service from a robot. The hotel guests defense the core of the hospitality industry which is human touch. The results also show that using or seeing a service robot in a hotel environment help to reduce fear towards them. Similarly, Zhong et al. (2020) found that the people who watched a video about service robot working in a hotel, showed higher intention to book a room in the hotel. Interestingly, no difference was determined between two groups when it came to the advantages of the robots. This study has several limitations like many others. The first limitation is the sample size. Even though the sample size is suitable to conduct the analyses, larger sample group may provide more generalizable results. The second limitation is the question about the service robot existence in the hotels where the respondent stayed. The authors did not ask whether there was a service robot in the hotel. The third limitation is the ignorance of the respondents who have not experience with a service robot. The authors assumed that the respondents who had zero experience with a service robot might have enough knowledge about it to complete the questionnaire. Despite some negative aspects of robots in the industry, many positive aspects and advantages arise from the study exemplifying the unique and innovative technological advancements robots can bring to the industry. The efficiency, convenience, information, experiences, features, and interactions will all create a robotic experience like no other for the industry and its guests. The perceptions of the use of robots in hotels as perceived by hotel guests is very positive with exciting innovative experiences. Previous studies mainly focused to answer the similar questions, but sample of the studies mostly have not used or seen a service robot before. More research in the hospitality context is needed with the participants who have experienced with a service robot to obtain more detailed insights. The results showed that there are significant differences between users and non-users of service robots in hotels. There is more research needed in this area to understand how the use of a service robot influences the attitudes and behaviors of customers.

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