Research on Improving Customer Satisfaction of Hotel Robot Service Based on Web Text Analysis

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Abstract. With the gradual development of artificial intelligence, the hotel has fully applied robot services in the daily operation of the hotel. Robot services can help guests quickly self-check-in, room delivery and contactless delivery of takeout, greatly enhancing the customer's hotel experience. This paper specifically consulted literature to comprehensively understand the relevant knowledge of hotel robot service and customer satisfaction, and then used network text analysis to capture a large number of hotel customer reviews of JI Hotel, and through further data processing and analysis, understood the initial impression of customers on service robots. According to the problems existing in the robot service of the JI Hotel, the reasonable and easy to use customer satisfaction improvement strategies and suggestions are summarized. It is expected to provide reference for future research on hotel robot service.

1 Introduction

In the context of the rapid development of artificial intelligence and robotics, empowered by technologies such as big data, cloud computing, Internet of Things and 5G, robot services are gradually being applied in the daily operations of mid-to-high-end hotels. Especially with the intelligent "contactless service" being used in more and more hotels, it is labelled as "assured" and "fast" for hotels in their daily operations. In the final analysis, the success of the application of hotel robot service depends on the satisfaction of the hotel's in-house guests. Therefore, it is of great significance to study the customer satisfaction improvement strategy of hotel robot service. With the popularization of online technology and social media, online text has become an important way for consumers to communicate with hotels. Through online text analysis, it can capture consumers' evaluations, suggestions and needs for hotels, and provide more valuable information for hotels.

At present, the application of hotel robots at home and abroad is still in its infancy, and domestic related research is relatively lacking, while foreign research has shown a growing trend since 2020. Scholars generally pay attention to the motivation of hotel robot application, and believe that robots can make hotels supplement human services and cope with seasonal labour problems. Lee et al. identified the job responsibilities that robots can replace in hotels, and optimized the design of logistics systems using robots [1]. Osawa et al.'s investigation found that robots can be integrated into different service scenarios of hotels, and even complete a complete set of hotel service processes. Ivanov et al. emphasize the shift in responsibilities between robots and humans, defining the scope of how robotics can be matched to hotel work tasks. More studies focus on the important subject of customers, and explore key issues such as customers' cognition, attitudes and behaviours towards robots [2]. Lee et al. studied the customer's cognition of robot use behaviour, and found that six factors, including performance expectation, convenience, social existence, hedonic motivation and perceived importance of the functional dimension, positively affected the customer's use behaviour [1], and in Laura et al.'s study, the functional dimension was the dimension that customers evaluated the most about robot use, as high as 79.72%.

There have been many studies on customer satisfaction in the academic community, but the robot service industry, as an emerging technology industry, started late, so the research on robot service is not sufficient. Based on this, this paper constructs a model of the influencing factors of hotel robot service on customer satisfaction, takes JI Hotel of Penglai Zhonglou East Road Branch as an example, analyses the customer satisfaction of hotel robot service based on the network, and proposes a strategy to improve the satisfaction of hotel robot service, which is helpful to promote the sustainable development of JI Hotel of Penglai Zhonglou East Road Branch.

2 Materials and methods

2.1 A model of influencing factors of customer satisfaction with hotel robot service

From the perspective of satisfaction model, the ACSI model, which is widely used in the service industry, takes customer expectations, perceived quality, and

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perceived value as the measurement indicators of customer satisfaction. Based on the ACSI model framework, Sun constructed a model of the influencing factors of hotel robot service on customer satisfaction [3]. Through a variety of research methods, 12 influencing factors of customer satisfaction with hotel robot service were finally established, specifically: service efficiency level: the accuracy of robot service, the speed of robot service, and the difficulty of robot operation process; service security level: the security of personal information in human-machine dialogue, the security of operating robots, and the protection of customers' personal and property by robots; service emotion: anthropomorphism of robot appearance, robot emotion recognition and expression, and effectiveness of robot handling complaints; at the level of service categories: the types of robot services in the front office, the types of robot services in the catering department, and the types of robot services in the housekeeping department [4, 5]. It is also clarified that the service robot has the greatest impact on hotel customer satisfaction in the three aspects of personal information security, service accuracy and operational security, which provides a theoretical basis for this paper.

2.2 Materials

Founded in 2010, JI Hotel is a mid-range brand of H World Group Limited, and as of May 2023, JI Hotels has more than 1,700 stores in 31 provincial-level administrative regions and 220 cities across China. It became the second mid-range hotel brand in China to open more than 1,000 stores. JI Hotel of Penglai Zhonglou East Road Branch is located at No. 94, Zhonglou East Road, Penglai City, Yantai City, with complete supporting facilities and convenient transportation. There are two types of robot services available at JI Hotel of Penglai Zhonglou East Road: intelligent check-in service at the front desk and room delivery service. The intelligent robot at the front desk only needs to scan the customer's ID card and face recognition to pop up the room card, and the service has achieved 30 seconds of check-in and 0 seconds of check-out; after guests check in to the hotel, all takeaway packages will be delivered to the door by the "Yunji Technology" intelligent robot, and guests can also choose the items they need to place a free order through the room delivery function of the "Huazhu Club" APP, such as toilet paper, bottled mineral water, towels, slippers, etc., which will be delivered to the customer's floor room within 15 minutes.

In this paper, JI Hotel of Yantai Penglai District Zhonglou East Road Branch was selected as the research object. Ctrip and Meituan have a large number of users, rich review content, and a sufficient number of comments, which are very suitable for text collection and analysis. Use the web mining software "Octopus" to scrape the content of the hotel's post-consumer customer reviews. Because there is a large amount of data unrelated to the robot service in the online comments, after exporting the crawled data, the author conducts a preliminary manual screening of all the data, removes a large number of comments unrelated to the robot service, and then uses the filtered data for further analysis. In order to ensure the accuracy of the text data, the following principles are followed: the text content is online and informative; eliminate duplicates, pasted and copied content texts and blank invalid comments; excluding the text with advertising information, nearly 300 real and effective reviews of guests were finally obtained. ROST CM6 was used to analyse valid data [6].

2.3 Methods

Text analysis is a research method that objectively and quantitatively describes explicit text content, which can obtain the complete expression of customers' consumption experience and real psychological perception in a relatively short period of time. Through the capture of online comments, this paper hopes to reproduce the customer experience as much as possible from the real customer messages, find out the problems existing in the current JI Hotel robot service, and conduct a preliminary analysis and exploration of the robot service improvement strategy.

3 Results and Discussion

3.1 Analysis of the current situation

3.1.1 Word frequency analysis of robot service evaluation

Using ROSTCM6 software, the word frequency analysis of the preliminarily sorted network evaluation text was carried out, and the top 39 high-frequency words with word frequency were extracted, and sorted according to the word frequency from large to small, and the high-frequency words about the JI hotel robot service experience were obtained, as shown in Table 1. Due to the preliminary data screening, the frequency of high-frequency words is relatively concentrated.

Table 1. High-frequency vocabulary list of JI Hotel robot service evaluations.

No.	Keywords	Word frequency	No.	Keywords	Word frequency
1	robot	280	21	location	137
2	room	277	22	personnel	130
3	convenient	251	23	perimeter	126
4	intelligent	244	24	child	124
5	technology	231	25	Information	122
6	serve	227	26	Gifting	120
7	reception desk	213	27	Stay	114
8	person	213	28	Brush your face	104
9	place	211	29	comfortable	100

10	experience	199	30	club	83
11	satisfied	190	31	Intelligent	78
12	Takeaway	180	32	Distribution	72
13	breakfast	179	33	So so	67
14	like	177	34	Face recognition	66
15	hygiene	172	35	safe	41
16	self-help	167	36	Little robots	40
17	shortcut	164	37	Lovely	33
18	facility	156	38	slow	28
19	Environment	155	39	Not bad	26
20	clean	137			

In order to analyse the customer's concerns in the comments more comprehensively and discover the core information hidden in the text, the author further screened the high-frequency words, removed the words that are irrelevant to the analysis of this article and the words that appear too low in frequency, and then conducted a word cloud analysis to obtain the high-frequency word cloud map as shown in Figure 1.

Fig. 1. Review word cloud map of JI Hotel of Yantai Penglai District Zhonglou East Road

The larger the font size of a word in the word cloud, the more frequent the word appears, and the smaller the font size, the lower the frequency of the word. Through the word cloud map, we can find several aspects that customers mainly pay attention to. First of all, there are words related to hotel hardware and robots. "Robot", "room", "front desk", "facilities", etc., because hardware facilities are the most important foundation of hotel management, and they are also the places that customers pay the most attention to in the hotel experience. Secondly, there is the service experience. The words involved include "convenience", "self-service", "service", "experience", "characteristics", etc. It roughly describes the experience of hotel guests using robot services. Finally, there is a general overview of the scope of application of bot services. "Face recognition", "intelligence", "check-in", "delivery", "takeaway", etc. Figure 1 shows that the words "robot", "room", "service", "convenience" and "intelligence" appear more frequently in the online reviews of several well-known all-season hotels in Yantai, indicating that the overall impression of robot service by customers is more positive. The frequency is slightly lower than these "experience", "self-service", "technology", and "takeaway", which reflects the understanding and proficient use of robot service scenarios by customers who have used robots.

3.1.2 Analysis of sentiment of robot service evaluation

The sentiment analysis function of ROSTCM6 was used to analyse the online review text of the robot service evaluation of JI Hotel of Penglai Zhonglou East Road Branch. According to the data, most hotel customers showed positive emotions about the use of robot services, accounting for 86.75%, of which 44.47% were highly positive, accounting for the highest proportion, 42.23% were low positive emotions, 2.13% were neutral tourists, and 11.12% were negative tourists.

3.1.3 Analysis of the current situation of customer satisfaction with robot service

It can be seen from the sentiment analysis of high-frequency words in the above article that the overall customer satisfaction of robot service of Yantai JI Hotel of Zhonglou East Road Branch is good, with positive evaluations accounting for 86.75%, while neutral evaluations and negative evaluations account for less proportions. Furthermore, all the negative reviews in the online text were analysed, and all the negative reviews were classified and summarized according to the influencing factors of hotel robot service on customer satisfaction, and the classification table of negative reviews influencing factors as shown in Table 2 was obtained. It can be seen that customers are dissatisfied with robot service, mainly because the service efficiency and service safety of the robot do not meet customer expectations, and customer satisfaction will also be affected by the service emotion module.

Table 2. Negative Evaluation Classification of JI Hotel of Penglai Zhonglou East Road

Indicators	Elements	Vocabulary	Evaluation examples
Service efficiency	The speed of the bot service	slow	It's just that the robot response is a little slow, and it took more than ten minutes to check in
		wait	During the peak tourist season, there were too many people, and it took a while to arrive for us
	Accuracy of the bot service	Take the	The little robot took the room

		wrong one	card wrong, but the front desk was very good
	How easy it is for the robot to operate the process	troublesome	For middle-aged people, robots get a bit of a hassle
Service Security	Personal information security for human-machine conversations	Information	I'm a little worried about whether my personal information will be leaked
	Safety in operating the robot	safe	It's hard to say whether it's safe or not, so it's hard to use
		dangerous	The child almost got caught in his hand, which was a bit dangerous
Serve emotion	The effectiveness of the bot in handling complaints	Evaluations are useless	The meal was delivered incorrectly, the evaluation was useless, and no one dealt with me

3.2 Reasons for low customer satisfaction with bot services

3.2.1 During peak periods, the robot cannot provide services in a timely manner

First of all, in the online text capture of customer satisfaction with the robot service of the JI Hotel, it was found through relevant data screening that the word "slow" describing the robot service experience appeared 28 times in the overall high-frequency word statistics, accounting for about 9.3% of the overall high-frequency words and nearly 70% of the non-positive sentiment comments. As can be seen, the proportion of negative reviews about timing is quite high, and the combined proportion of negative and neutral reviews is much higher than the proportion of positive reviews, so this is an urgent issue for the optimization of the bot service of JI Hotel. "During the peak travel period, there are too many people, and it took a while to arrive at us", through the study of online reviews, it can also be found that customers' complaints about robot service mainly come from the peak period, because the hotel is only equipped with an intelligent robot, during the peak hours of lunch and dinner, the single-threaded work is difficult to meet the demand for high-concentration takeaway delivery, so there is a problem of unable to serve in time.

3.2.2 The operation process and steps of the robot are not concise enough

Combined with the above, "the robot response is a little slow, check-in for more than ten minutes", "for middle-aged people, the robot makes a little troublesome" such negative comments, to a certain extent, also reflect the robot service operation design process is not concise and clear, although the hotel has optimized the operation process for the robot service several times, the early investment in the capital cost and research and development costs should not be underestimated, but due to the complexity and diversity of the actual work situation, the underlying logic code of the robot is difficult to thoroughly optimize and modify, due to force majeure and other reasons, robot services will still occasionally fail to provide services, usher in customer disappointment, lead to a decline in customer satisfaction, and the hotel will receive related complaints, which is not conducive to the shaping of a stable hotel brand image. But this is an event that is extremely difficult to avoid in the actual operation of the hotel. There are still many difficulties to overcome in optimizing the operation process of robots.

3.2.3 Robot services are at risk of revealing customer information

"It's hard to say whether it's safe or not, so let's use it reluctantly", "I'm a little worried about whether personal information will be leaked". The author has noticed that some customers are worried about whether the use of bot services will lead to the disclosure of their private information. In the process of providing services by robots, the vast majority of hotel employees are able to securely handle guest data, including data privacy, data quality, and data protection, while maintaining the daily functions of the robots. For example, whether the background data processing system of the front-end service robot can ensure that private data such as guest ID cards, bank cards, and face recognition are not leaked. But there is still a risk of data breaches due to accidents or failures. This will bring great insecurity and distrust to customers, and become a hidden concern for hotel robot service operations.

3.2.4 Service evaluation feedback and service remediation are not timely

From the analysis of the negative emotional comments of customers, it can be seen that "the meal was delivered incorrectly, the evaluation was useless, and no one dealt with me." This shows that the speed and ability of the hotel to deal with the problem of service failure are still insufficient. After the customer successfully receives the goods, the JI Hotel robot will actively invite the customer to evaluate the customer in the form of "scoring this service", from one to five points, a total of five evaluation dimensions. But since hotel robots are always very busy, there is not much time left for customer reviews and feedback, only about 5 seconds. Even if a customer has more feedback on a hotel bot, they have to complete the review in less than 5 seconds. This virtually blocks the right of hotel guests to evaluate and give feedback. In some non-standardized special scenarios, bot services are more likely to fail services. "The child almost got caught in his hand, which was a bit dangerous. It reflects that for special customers such

as minors, operating robots is still unsafe. For example, a child comes forward to pet the robot out of curiosity, and accidentally suffers a slight injury. In the high-frequency word analysis table, the word frequency of "child" is 124, accounting for 41%, indicating that it is a very easy element to appear in the robot service scenario.

In the current situation, the service that the robot can provide is realized through a fixed programmatic design, and in the whole service process, the flexibility of the robot service is still at a low level compared with the human service, and when the service fails, it is often only possible for human employees to come to comfort the customer and carry out service remediation. But human employees are generally slow to know the situation for a while and are unable to deal with it in a timely manner. If we want to realize the whole process of service remediation, there is still a long way to go in terms of technology and practical application.

3.3 Boost strategy

3.3.1 Set a wait time and gain customer understanding

Bots are largely unavoidable during peak periods, so hotels should do their best to determine how long guests are waiting for bots. Because the uncertainty of waiting increases the anxiety of customers, customers have formed their own expectations based on past experience, and when the customer has not yet enjoyed the robot service after the appointment time, the customer will be more anxious, and the customer may be angrier, which will lead to dissatisfaction. Therefore, providing customers with accurate information about the expected waiting time or location of the robot service in the queue, or about the waiting reason for the delay of the robot service, can often make the customer psychologically get the feeling of being noticed, and produce a pleasant, positive feeling. It is worth noting that there should be clear waiting rules for robot services, and when customers understand the priorities and rules, customers will perceive fairness in the process, and therefore, the longer they are willing to wait.

3.3.2 Optimize the robot operation process and steps

From the above word frequency analysis, it can be seen that the vast majority of customers use hotel service robots, and the ease of use and high efficiency of robots are one of the most important reasons. From this, it can be deduced that the key requirements of customers for the use of robots: to ensure the efficiency of robot service and to provide accurate service to customers at the first time. This requires the hotel to strictly control the service functions of the service robot, and regular maintenance, and to ensure that the robot is used frequently without a large number of failures. Minimize service failures due to machine issues that can lead to a bad guest experience. This is extremely important at JI hotels that use bot services frequently. In addition, the service and operation process of hotel robots is also a very critical part. If the robot is designed with a concise and smooth operation logic before it is put into operation, it can not only compress the customer's use time and achieve another leap in the hotel's daily work efficiency, but also allow customers to feel the improvement of the quality of life brought about by scientific and technological progress, which is of great benefit to the improvement of the overall image of the hotel. At the same time, this also means that JI Hotel should have the relevant funds and manpower to invest in the daily maintenance and maintenance of the robot, hoping to improve the satisfaction of in-house guests through the service with as few negative reviews as possible.

3.3.3 Improve the security of customer information for robot services

When people face emerging technologies, personal information and privacy security are often one of the most important factors for consumers. As an emerging service item in recent years, hotel robot service can also refer to this. The security of personal information is the most important thing for customers when using hotel bot services. This means that the security of your data will have the greatest impact on hotel guest satisfaction. Therefore, when hotels jointly develop or purchase robots, data security must be one of the highest priority considerations [7]. In the hotel's daily robot service use specifications, it is also necessary to pay attention to the protection of customers' personal privacy and beware of data leakage. For example, regularly maintain and check the data situation of hotel robots, update firewalls, security systems, etc. in a timely manner. Strengthening the protection of the security of customers' personal information can not only improve customer satisfaction and loyalty, but also virtually avoid a series of moral incidents and legal risks caused by negligence in information security.

3.3.4 Combine manual service with machine service to improve service remediation and feedback mechanism

For a long period of time, the intelligent robots used in robot services need to be regularly maintained and upgraded by human employees, and in special cases of service failure, human employees are also required to remediate the service in a timely manner and convey apologies and sincerity to the guests. The results show that timely and humane manual service can still offset the negative impact of customers after encountering bad service experience, which is conducive to the positive improvement of customer satisfaction. These employees who are connected with the robot service work directly face the customer in the process of service remediation, and their performance directly affects the customer's satisfaction with the quality of the robot service. If the staff who carry out the service remediation can effectively deal with the problems faced by the customer, and at the same time give the customer a genuine emotional support, then the reliability and empathy dimensions of customer satisfaction will be effectively

improved. Therefore, it is very important that employees can provide timely and enthusiastic service to customers, and how willing they are.

4 Conclusions

As one of the well-known brands of H World Group, JI Hotel has always strived for progress and technological innovation. As a mid-range hotel brand, JI hotel can provide bot services to customers, so researching robot services and guest satisfaction is an important part of optimizing hotel operations strategies. This paper focuses on the one of the most representative JI hotel in Penglai District, Yantai City, Zhonglou East Road Branch in Yantai Penglai District, captures the online comments of the hotel, preliminarily explores the perceived value and satisfaction of customers using service robots, summarizes the problems existing in the application of robot services in the hotel, and tries to put forward corresponding improvement and promotion strategies. In the future, the improvement of robot services must be based on improving customer satisfaction, and innovative application scenarios must be defined by mining the advantages of robot services, so as to ensure the steady and orderly development of robot services.

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