Research on the Influence of Cuteness Design of Service Robot on Hotel Customer Tolerance

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Abstract. Service robots are increasingly used in the hotel industry, However, service failure is inevitable during service delivery. Based on social information processing theory, this paper explores the influence of cuteness design on customer tolerance of service robots, and examines the mediating effect of empathy. Based on two cuteness design methods, the study adopts two situational experiments for hypothesis verification. The research conclusions are as follows: In the case of service failure, cuteness design of service robot can improve customer tolerance; Compared with the low-cuteness service robots, the high-cuteness service robots were more likely to stimulate customer empathy; Empathy mediates the effect of cuteness on customer tolerance.

Keywords: Service Robot; Cuteness; Customer Tolerance; Service Failure

1 Introduction

The onging COVID-19 crisis has further increased the automation trend of front-line service robots in the hotel industry. However, customers have also found some limitations in the process of using service robots, which may make customers dissatisfied and lead to service failure [1]. The service robot handles the service failure according to the preset algorithm, and may not be able to select an effective remedial strategy [2]. Previous studies have shown that the shape of a robot plays an important role in how it is accepted and adopted [3]. “Stimulus organism response” (SOR) believes that external stimuli will cause individuals to produce cognitive processes, and then affect their subsequent behavioral tendencies [4]. Therefore, in the framework of SOR, this paper uses the social information processing theory to build a model to explore the customer’s response to the cute design of service robots from the perspective of customer tolerance, and reveals the intermediary mechanism.

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2 Literature review

2.1 Application research of service robot

Service robots refer to artificial intelligence that interacts, communicates, and delivers services to an organization's customers through autonomous and adaptive interfaces of the system [5]. As it can bring high efficiency and other functions, service robots are widely used in various front-line areas of the hotel industry to provide services such as check-in/check-out procedures, meal delivery and interaction with customers. However, if the robot does not meet the customer's needs, it can become an obstacle and lead to service failure [1].

2.2 Service failure and customer tolerance

Many researchers have classified service failure, among which result failure and process failure have been widely used. A large number of research results show that service failure will lead to dissatisfaction behavior [6]. For the hotel industry, service failure can easily lead to unequal customer relationships, and tolerance can adjust this unequal relationship [7]. In this paper, the definition of Xiong Wei et al. is adopted to define customer tolerance as the process in which customers overcome the negative emotions caused by robot service failure and make a series of constructive responses in the context of service failure [6].

2.3 Appearance design of service robot

According to the degree of anthropomorphism, service robots can be divided into three types: humanoid, mascot-like and machine-like. Among them, the mascot like service robot is considered to represent the cute appearance of the robot [8]. The appearance design of service robots has been influenced by the Uncanny Valley theory, which states that when a humanoid robot approaches but fails to achieve a realistic appearance, the human response suddenly shifts from sympathy to disgust [9]. In order to avoid the Uncanny Valley effect, cute seems to be a good choice [10]. Cuteness originates from the infant schema proposed by Lorenz scholars, which clearly explains Charles Darwin's view that loveliness has an evolutionary function [11]. We mainly focuse on the cute dimension of the infant schema. As for the service robot, it mainly refers to the appearance design and the way of speaking of the service robot.

3 Hypothesis proposed

3.1 Influence of cuteness design of service robot on customer tolerance

According to the social information processing theory, customers will process the signals sent by the behavior subjects and then use them to guide the corresponding behaviors [12]. Cute stimuli can produce strong positive emotional responses, thus

reducing the severity of software errors perceived by users in human-computer interaction [13]. The cuteness perception of the AI assistant has a positive effect on the tolerance of service failure [14]. Thus, we believe that the "cute performance" of service robots after service failure will have a positive impact on the tolerance of customers. Therefore, the following hypothesis is proposed:

H1: In the case of service failure, customers' tolerance of low-cuteness service robots is lower than that of high-cuteness service robots

3.2 The influence of cute design of service robot on empathy

Empathy is defined as "the ability to recognize, understand and respond to other people's thoughts, feelings, behaviors and experiences" [15]. In order to activate the positive impact of infant schema features, marketers must create a consumption environment related to cute response [16]. Imperfect AI devices can express their emotions through facial expressions and vocabulary, which can resonate with users and in turn inspire empathy [17]. Thus, we believe that the more cute the feature is, the easier it is to stimulate customer empathy. Therefore, the following hypothesis is proposed:

H2: In the case of service failure, compared with low-cuteness service robots, high-cuteness service robots can stimulate customer empathy

3.3 The intermediary role of empathy

Empathy has a significant positive impact on consumers' willingness to forgive [18], which can be understood as the basic skills required for a successful interface between users and social robots. Based on the social information processing theory, the "cute" information of service robots will affect the cognitive judgment of customers on the "emotion" of service robots, which will affect the tolerance of customers in the service remedy interaction. Thus, we believe that after service failure, cuteness can make the psychological distance between the service robot and the customer closer, so as to stimulate the customer's empathy and thus enhance the customer's tolerance. Therefore, the following hypothesis is proposed:

H3: In the case of service failure, the influence of empathy intermediary cuteness on customer tolerance

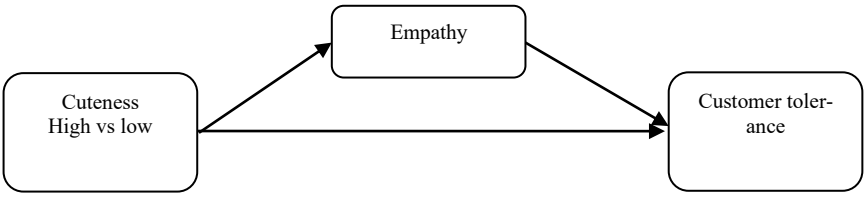

Fig. 1. Theoretical model.

4 Experiment 1

4.1 Experimental design

In Experiment 1, a single factor (cuteness: high vs low) inter group experimental design was used to test the effect of cuteness design of service robots on the tolerance of hotel customers in the case of service failure. First, the selection process fails. The pictures of different cuteness of service robots refer to the research of Choi et al. (see figure 2) [19]. A total of 47 questionnaires (42.6% male) were collected in the pretest. Independent sample t-test results showed that the mean value of the high cuteness group was significantly higher than that of the low cuteness group (M_{low}=4.383, M_{high}=5.234, t (df) =-3.153 (92), P =0.002<0.05). Therefore, the experimental materials were manipulated successfully.

a b

Fig. 2. Service robot picture (a: low-cuteness; b: high-cuteness)

4.2 Formal experiment

The experimental materials were consistent with the pre-test, and the experimental situation was determined as the hotel check-in scene: The service robot identified the ID card several times before successfully identifying it and checking in for you. The two experimental groups were identical in all aspects except for the service robot pictures. After reading the experimental materials, the subjects were asked to fill out questionnaires on service failure severity, cuteness, empathy, customer tolerance, and demographics. The formal experiment recruited 114 college students and randomly assigned them to one of two experimental groups. 91 valid samples (45.1% male) were collected at last, and the age distribution was mainly 18-25 years old, accounting for 97.8%.

4.3 Results and Discussion

First, manipulation test. Independent sample t-test results showed that there was no significant difference in the perception of the severity of service failure between groups (M_{low}=4.773, M_{high} =4.575, t (df) =0.895 (89), P =0.373>0.05). The subjects' perception of the high cuteness group was significantly higher than that of the low

cuteness group (M_{low}=3.430, M_{high}=4.130, t (df) =-2.810 (89), P =0.006<0.05), and the independent variables were successfully manipulated. Secondly, the results of one-way ANOVA showed that cuteness had a significant difference in customer tolerance (α=0.84) (M_{low}=3.759, M_{high} =4.362, F (1,89) =8.725, p=0.004<0.05). There was a significant difference in empathy (α =0.92) for cuteness (M_{low}=3.040, M_{high}=3.862, F (1,89) =10.815, p=0.001<0.05). This indicates that compared with the low cuteness group, the high cuteness group has higher customer tolerance and empathy. H1 and H2 have been preliminarily verified.

5 Experiment 2

5.1 Experimental design

Experiment 2 used a single factor (cuteness: high vs low) inter-group experimental design to further test the robustness of experiment 1 results and the mediating mechanism of cuteness design. Experiment selection results fail, and cute speech stimuli are used. The speech of service robot with different cuteness is referred to Lv et al. 's research [14]. A total of 45 questionnaires (51.1% male) were collected in the pretest. Independent sample t-test results showed that the mean value of the high cuteness group was significantly higher than that of the low cuteness group (M_{low}=3.800, M_{high}=5.956, t (df) =-7.803 (61.464), P =0.000<0.05). Therefore, the experimental materials were manipulated successfully.

5.2 Formal experiment

The experimental materials were consistent with the pre-test, and the experimental situation was determined as the hotel dining scene: When you ask the service robot for a local specialty recommendation, the service robot cannot understand your needs. The two experimental groups were identical in all aspects except the service robot voice. A total of 107 participants were recruited from social groups and randomly assigned to one of two experimental groups. 87 valid samples (32.2% male) were collected at last, mainly aged 18-25 years (72.4%) and 26-35 years (23%).

5.3 Results and Discussion

First, manipulation test. Independent sample t-test results showed that there was no significant difference in the perception of the severity of service failure between groups (M_{low}=4.674, M_{high}=4.114, t (df) =1.861 (85), P =0.066>0.05). The subjects' perception of the high cuteness group was significantly higher than that of the low cuteness group (M_{low}=3.23, M_{high}=5.25, t (df) =-6.229 (85), P =0.000<0.05), and the independent variables were successfully manipulated. Secondly, the results of one-way ANOVA showed that cuteness had a significant difference in customer tolerance (α=0.896) (M_{low}=3.740, M_{high}=4.555, F (1,85) =9.328, p=0.003<0.05). There were

obvious differences in empathy (α=0.938) for cuteness (M_{low}=2.942, M_{high}=4.494, F (1,85) =26.336, p=0.000<0.05). This shows that cute design effectively promotes customer tolerance and customer empathy, H1 and H2 have been verified again. Finally, the Bootstrap procedure in the PROCESS plug-in was used to verify the mediating effect of empathy. The results showed that the mediating effect of empathy existed, and the mediating effect size was 0.335, the interval was LLCI = 0.154, ULCI = 0.522, and the mediating test results did not include 0, so H3 was verified.

6 Conclusion and enlightenment

6.1 Theoretical contribution

First, the current research on anthropomorphic features of service robots mainly focuses on humanoid features, with insufficient attention to cuteness. The results of this paper enrich the research on appearance design of service robots. Second, most of the current studies discuss the influencing factors of customers' willingness to use service robots, and the effects of cuteness are not uniform. The research results of this paper provide evidence for the positive effect of cuteness, which can enrich the research on the influence of cuteness on customer behavior response in the field of service failure. Finally, the current research on human-machine empathy has not received the attention of most scholars. The research results of this paper can enrich the research on the influence mechanism of cuteness design on customer response in the context of service failure.

6.2 Practical implications

First, pay attention to service failure. When introducing service robots, hotel should not only pay attention to the improvement of technical level, but also pay attention to the remedial measures of service failure, such as cute appearance and sound. Second, pay attention to the psychological mechanism of customers. By providing “advanced” service failure management measures, the psychological intervention of customers in the process of service failure is effectively carried out, and the tolerance of customers is promoted, so as to reduce the occurrence of customer complaints or even loss caused by the fault of service robots.

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