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HUMAN VS ROBOT SERVICE FAILURE: INVESTIGATING CUSTOMERS' FORGIVENESS AND SERVICE RECOVERY EXPECTATION

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Abstract: This research investigates customer responses to service failure when engaging with different service provider agents (SPAs) in terms of forgiveness and service recovery expectation (SRE). A 3 (humans vs humanoid robots vs non-humanoid robots) × 2 (process vs outcome failure) between-subjects experimental design was utilized. One-way ANOVA was performed to test the mean difference of forgiveness and SRE when engaged with different SPAs under different types of service failure. Correlation and linear regression were adopted to explore their relationships with customer dissatisfaction. The findings demonstrated that customers experiencing service failure delivered by SPAs with higher humanness have lower forgiveness and higher SRE in the process failure situation, while service failure delivered by SPAs with lower humanness have higher forgiveness and lower SRE. However, there is no significant difference in the outcome failure situation. Furthermore, forgiveness and SRE have negative and positive relations with customer dissatisfaction respectively. This study has both theoretical and managerial implications.

Keywords: *Service provider agent, Humanness, Service failure, Customer forgiveness, Service recovery expectation, Dissatisfaction*.

I. INTRODUCTION

The trend of humans and service robots working together as service provider agents (SPAs) is on the rise. Robots can be categorized into humanoid robots and non-humanoid robots based on robot anthropomorphism (Gong & Nass, 2007). Service failures are inevitable regardless of the SPAs involved in the service delivery due to a variety of technical issues and uncertainties (Honig & Oron-Gilad, 2018).

This study investigates customers' level of forgiveness and service recovery expectation (SRE) toward different SPAs (humans vs humanoid robots vs non-humanoid robots) in the event of two types of service failure (process vs outcome). Also, the impact of forgiveness and SRE on their level of dissatisfaction was assessed. Customers' willingness to forgive and SRE are two important indicators of their perception towards the business and willingness to re-patronize. In most Human-Robot Interaction (HRI) failure studies, the type of failure has not been identified. Furthermore, most scholars address customer responses to service failures based on how they evaluate the service organization, rather than the SPAs. Understanding how customers perceive different SPAs can help companies rationalize service scenarios for SPAs and minimize the negative impact of service failures.

This study aims to answer the following research questions: 1) Do customers have varying levels of forgiveness when experiencing different types of service failures involving different types of SPAs? 2) Do customers have varying levels of SRE when experiencing different types of service failures involving different types of SPAs? 3) How will customers' forgiveness and SRE affect their level of dissatisfaction after a service failure?

II. LITERATURE REVIEW

A. Mind perception theory

According to the mind perception theory (Bigman & Gray, 2018), both human and non-human entities are perceived in terms of two dimensions: agency (i.e., thinking, planning, and acting ability) and experience (i.e., the ability to experience pain, pleasure, and emotions). In contrast to human adults who are thought to have both high agency and high experience, robots are often thought to have low experience and intermediate agency. When SPAs have high perceived agency and experience, they will be considered autonomous and trusted, namely, they are capable to make decisions, act intentionally and volitionally, and more likely to take more responsibility when services fail (Schein & Gray, 2018).

B. Prospect theory

Previous studies (Bitner, Boom, & Tetreault, 1990) divide service failure into process failure (i.e., fundamental needs are met yet flawed or inadequate) and outcome failure (i.e., basic requirements are not met). Prospect theory indicates that individuals evaluate the outcome based on their perceived gains and losses rather than the absolute value of the object (Kahneman & Tversky, 1979). People are more sensitive to losses than to gains and may be more willing to tolerate minor process failures, which are

perceived as a lower loss, than basic outcome failures, which are perceived as a higher loss. Customers may experience a sense of injustice or inequity due to there is a mismatch and imbalance between the service received and the price paid when their basic needs are not met, which may lead to a similar level of grievance and dissatisfaction regardless of the type of SPAs.

H1a. In the event of a process failure, there is a significant difference in customer forgiveness for different SPAs, such that the lower the humanness of SPAs, the greater the forgiveness from customers.

H1b. In the event of an outcome failure, there is no significant difference in customer forgiveness for different SPAs.

H2a. In the event of a process failure, there is a significant difference in customers' SRE for different SPAs, such that the higher the humanness of SPAs, the higher the SRE from customers.

H2b. In the event of an outcome failure, there is no significant difference in customers' SRE for different SPAs.

B. Expectancy disconfirmation theory

The expectancy disconfirmation theory (Pizam & Milman, 1993) defines disconfirmation as the gap between customers' anticipated expectations and actual performance outcomes. The higher their SRE, the more resources or efforts the SPA needs to invest to make up for the failure. Conversely, a low SRE is more likely to be met or satisfied, thereby mitigating the dissatisfaction. Similarly, forgiveness means low intention to call to account and lower SRE, which alleviates the dissatisfaction.

H3. Customers' SRE is positively related to customer dissatisfaction following a service failure.

H4. Customer forgiveness is negatively related to customer dissatisfaction following a service failure.

III. METHOD

Research design and sample

A 3 (humans vs humanoid robots vs non-humanoid robots) × 2 (process vs outcome) between-subjects experimental design was adopted in this study. The selection of SPAs are all female as Seo (2022) found that female service robots generated more pleasure and higher satisfaction than male ones. Respondents were randomly assigned to read one of the service failure scenarios and answer questions related to their perception and demographic and behavioral characteristics. The scenario setting was adopted from Smith, Bolton, and Wagner (1999) in a hotel check-in context: process failure (inattentive service: passionless receptionists addressing the guest by the wrong gender, i.e., Mr. as Ms. or Ms. as Mr.) and outcome failure (unavailable service: actual room type is not the type of room that the guest reserved).

All the instruments measuring forgiveness (Xie & Peng, 2009), SRE (Lin, 2010), and dissatisfaction (Sarofim et al., 2022) were adapted from prior research. The questionnaire was translated into Chinese by back-translation method to eliminate linguistic bias. A manipulation check was conducted to ensure the scenarios were distinct from each other. The population of interest for this study consists of individuals who are 18 or above and have stayed in a hotel within the past two years. The data was collected from 396 participants with monetary compensation (9 CNY per respondent, 1.27 USD equivalently) at online platform wjx.cn.

IV. RESULT

A. Respondents' demographics and reliability analysis

The majority of the respondents were female (56.8%), between the ages of 30–39 (51.5%), completed tertiary education (86.9%), had 6-10 times (41.2%) hotel stay experiences in past two years, and had 3-5 times (39.1%) robot interaction experiences. Cronbach's Alphas indicate that all three variables are reliable ($\alpha_{fogiveness}=0.832$, $\alpha_{SRE}=0.777$, $\alpha_{Dissatisfaction}=0.772$).

B. Differences in the event of process failures

The homogeneity of variance assumption was satisfied due to a non-significant result both on forgiveness ($p = .236$) and SRE ($p = .952$). One-way ANOVA was performed and the result showed a statistically significant difference does exist in three types of SPAs on customers' forgiveness ($F(2, 193)=7.844$, $p= .001$) and SRE ($F(2, 193)=8.789$, $p= .000$) in the event of process failures (Table 1). Post Hoc tests indicated that the significant difference lies between humans & non-humanoid robots ($p= .000$) on forgiveness, while it lies in humans & non-humanoid robots ($p= .001$) and humanoid robots & non-humanoid robots ($p= .003$) on SRE, that means the significant difference was only found between SPAs with the highest and lowest humanness on both forgiveness and SRE. Specifically, Non-humanoid robots had the highest level of forgiveness, followed by humanoid robots and last humans ($M_{Non-humanoid-robots}=4.106$ vs $M_{Humanoid-robots}=3.710$ vs $M_{Human}=3.373$), whereas human had the highest SRE, followed by humanoid robots and last non-humanoid robots ($M_{Human}=5.582$ vs $M_{Humanoid-robots}=5.524$ vs $M_{Non-humanoid-robots}=5.036$; Fig 1). Thus, H1a and H2a were supported.

Table 1.

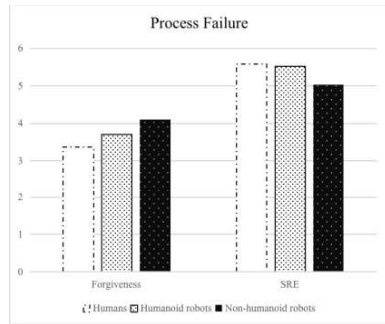*One-way ANOVA results in process failure*

DVs	Sum of Squares	Mean Square	F	Sig.
Forgiveness	17.89	8.945	7.844	.001
SRE	11.833	5.916	8.789	.000

Fig 1.

Mean difference in the process failure


C. Differences in the event of outcome failures

The homogeneity of variance assumption was also satisfied both on forgiveness ($p = .691$) and SRE ($p = .125$). One-way ANOVA results in outcome failure (Table 2) indicated that there is no significant difference in customers' forgiveness ($F= .085, p= .919$) and SRE ($F=1.925, p= .149$) among three types of SPAs. The mean of forgiveness and SRE presented a similar situation (Fig 2). Therefore, H1b and H2b were supported.

Table 2. *One-way ANOVA results in outcome failure*

DVs	Sum of Squares	Mean Square	F	Sig.
Forgiveness	.229	.114	.085	.919
SRE	2.902	1.451	1.925	.149

Fig 2.

Mean difference in the outcome failure
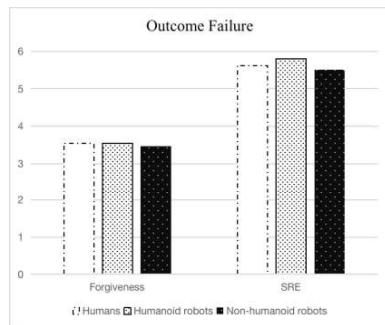
D. Relations exploration

Table 3 and 4 presented the hypothesis testing results of the relationship between forgiveness, SRE and dissatisfaction. According to the result, customers' SRE is positively related to customer dissatisfaction, support H3 ($\beta = .246, t= 6.581, p<.001$). H4, which states that customer forgiveness is negatively related to customer dissatisfaction was supported ($\beta = -.604, t = -16.188, p<.001$).

Table 3.

Means, standard deviations, and correlation

	1	2	3
1. Forgiveness			
2. SRE	-.420**		
3. Dissatisfaction	-.707**	.499**	
Mean	3.6218	5.5126	4.9621
Std. Deviation	1.13454	0.87157	1.25328

**p < .001.

Table 4.

Multiple linear regression analysis results

IVs	β	t-value	Sig.	Adjusted R Square
Forgiveness	-.604	-16.188	.000	.547
SRE	.246	6.581	.000	

DV=Customer dissatisfaction

V. DISCUSSION AND IMPLICATION

Previous studies offered controversial arguments for robot anthropomorphism and have been debated. Some indicated that the humanness of SPAs has a predominantly positive impact on customer satisfaction, acceptance of the robot and willingness to engage. On the other hand, a probable pitfall for humanoid robots is suggested by the "uncanny valley" (Mori, 1970), which asserts that people's attitudes toward robots shift to negative, unsettling and eerie at a certain inflection point. In reality, more and more humanoid robots are being deployed in hospitality settings. This study combines humanness of SPAs and types of failure to provide an unprecedented perspective. These results broaden the literature on service failure and HRI, and provide some managerial implications to hotel businesses. It gives a fresh angle by addressing customer responses to service failures based on individual personnel, rather than the service organization. The findings will also be useful for hotel managers to design which particular type of SPA will be appropriate for specific types of guest contact situations in anticipation of the occurrence of possible types of service failures.

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