Customers' Emotional Reactions toward Service Robots: A Mixed Methods Analysis in Retail and Elderly Care Service

Relevance

In the recent past, service robots and their customer reactions have gained much attention in academic and practical fields. The possibilities for applying these service robots do not solely include mechanical tasks anymore but also social interactions. These social interactions are especially important across services due to their direct customer contact in service encounters. Thus, when a service robot is implemented to engage directly with the customer, it is crucial to examine the customer-related emotional reactions since they lead to positive and negative outcomes. As customer needs and the coherent provider tasks, abilities, and requirements vary across different service types, it is recommended to examine the emotions toward service robots in each service type individually.

To our best knowledge, there is no empirical research on the emotions toward service robots comparing retail and elderly care services. Furthermore, the literature lacks empirical research on highly human-like android and gynoid service robots and their possible gender stereotypical effects across different service settings. Hence, the purposes of our study are to identify:

(1) the differences in customers' emotional reactions toward service robots in retail and elderly care services;

(2) the differences in customers' emotional reactions toward android vs. gynoid service robots in retail and elderly care services;

(3) the mediating role of anthropomorphism between service type and positive and negative emotions

Research Method

First, we conducted a literature review to document the current state of research regarding customers' (emotional) reactions toward service robots and to provide well-founded hypotheses. We then applied a mixed-methods approach with interviews and an online experiment followed by survey questions. Both the qualitative and quantitative research were scenario-based, using media (videos and pictures) and specific scenarios of human-robot interactions in the form of text.

In our qualitative research, we conducted 24 semi-structured personal interviews ranging from 19 to 42 minutes in length. Out of the participants, 50% were male and 50% were female, with a total mean age of 47. Out of the 24 interviews, 12 were confronted with a scenario in the elderly care service, while the other 12 obtained a scenario in the retail setting. Every interview contained material about an android and a gynoid service robot. However, to ensure the economy of the interviews and simultaneously control for biases through the order of gender appearances, we organized the 12 interviews in each service type by including six interviews that start with a gynoid service robot and a rather brief section with the android at the end – and vice versa. In each interview, the participants were asked to empathize with the scenarios of interacting with a service robot either in retail or elderly care and state their emotional reactions toward these scenarios.

For the quantitative research, we adapted the scenarios and media from the qualitative interviews. After data exclusion, we could acquire 177 participants, consisting of 41.8% males, 56.5% females, and 1.7% diverse participants, with a total mean age of 36. The online experiment was followed by survey questions regarding the emotional reactions and the anthropomorphism. In order to test our hypotheses, we included the emotions of fear, sadness, anger, shame, enjoyment, and interest and used the German version of the Differential Emotions Scale. Each emotion was comprised of three items, which were assessed on a 5-point Likert scale measuring the intensity of participants' emotional reactions. For the anthropomorphism

scale, we used the German translation of the anthropomorphism scale from the Godspeed Questionnaire.

Results

For qualitative content analysis, the deductive category system elaborated beforehand was additionally adapted with inductive categories. The analysis reveals that participants in the elderly care scenario mentioned emotions of fear, sadness, and anger more frequently. Unexpectedly, neither the elderly care nor the retail group brought up the emotion of shame. The positive emotion of enjoyment was mentioned solely by one participant, each in retail and elderly service. The emotion of interest was only mentioned in the retail scenario, in which four out of 12 participants stated that they would be interested and curious.

The two-way ANOVA with service type (elderly care vs. retail) and robot gender (android vs. gynoid) as the independent variables reveals significant mean differences in the negative emotions of fear, sadness, and anger between the service types, meaning that these are more intense in the elderly care scenario. However, the effect of service type on the emotion of shame is not significant. Regarding the positive emotions, on the one hand, we find significant differences in the emotion of enjoyment, revealing participants in the retail service to be more joyful or happy than those in the elderly care scenario. The emotion of interest shows no significant mean differences between elderly care and retail service. Concerning the robot's gender, we solely find a significant main effect of the robot's gender on the emotion of sadness, suggesting stronger emotions of sadness toward the gynoid service robot. We do not find interaction effects of service type *x* robot gender on the emotional reactions. The following mediator analysis shows no mediating effect of anthropomorphism between service type and emotional reactions. However, we find a significant effect of anthropomorphism on positive emotions.

We contribute to existing literature by identifying significant differences in the intensity of emotional reactions toward service robots between retail and the elderly care service. More

precisely, service robots in elderly care evoke stronger negative emotions, while participants in retail show stronger positive emotions of enjoyment. Furthermore, we contribute to the knowledge on anthropomorphism by first identifying no mediating role of anthropomorphism between service type and the emotions and, second, finding stronger positive emotions when participants anthropomorphize more strongly. Lastly, our findings suggest that the robot's gender does not play a crucial role concerning positive and negative emotions toward service robots.