

The Psychological and Behavioral Impact of the Use of Service Robots on Customers based on the S-O-R Theory Perspective

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Abstract. This paper focuses on the impact of service robots on customer psychology and behavior, systematically reviews the current service marketing research literature that focuses on service robots. This paper first compares the characteristics of service robots with those of human employees, and then presents the salient features of service robots in the provision of services. Finally, the paper discusses what can be further researched in the field of service robotics in the context of future artificial intelligence, complementing the existing research framework and suggesting new ideas for the study of artificial intelligence services.

Keywords: Service Robot; Customer; Customer Psychology; Behavioral Responses.

1. Introduction

Since the 21st century, AI has seen a growth spurt that has significantly transformed the service industry (Wirtz et al., 2018), quickly becoming an important basis for realising customer value across service industries. Among these, service robots based on AI technology have been particularly widely used and are becoming increasingly popular in industries such as catering, accommodation, healthcare and logistics. This has not only brought a new service experience to consumers, but also promoted the renewal and development of the existing model system of the service industry. In China's specific case, the rapid growth of the industry has pushed the volume of China's service robot market to nearly 40 billion yuan, making it a major service robot country occupying more than a quarter of the global market. According to China's National Bureau of Statistics, the cumulative output on the supply side of service robots reached 9,214,400 units in 2021, up 48.9% year-on-year. Related report predicts that annual sales of service robots in China are expected to reach 61.35 billion yuan in 2023, doubling from 2021, and will lead the global server man market development trend.

Considering the enormous potential of service robots in practice, many academics believe that robotics will become one of the key trends in the service sector in the coming years. This trend is currently manifested in concrete terms: service robots are being used in a wide range of sectors for their outstanding efficiency and their ability to adapt quickly to changes in procedures. For example, in the catering industry, Pepper, a service robot, has helped sell coffee machines in over 1,000 Nescafe shops in Japan and has served as a waiter at Pizza Hut Asia and a restaurant at Auckland International Airport; in the healthcare industry, in 2018, the first domestic mobile app focused on artificial intelligence mental health services, "Biyou Psychology " was the first to combine AI with CBT therapy in the field of psychology; in the hotel industry, Huazhu Hotel Group delivery robots delivered an average of more than 200,000 times per month, etc.

Existing research on service robots varies, with some scholars arguing that service robots develop in the order of mechanical, analytical, intuitive and empathetic, with the first to engage in 'lower' intelligence tasks (Hui et al., 2018), for example, Leite et al. (2013) believed that empathy and compassion are two human qualities that machines lack; and it has also been argued that AI can be empathetic in service (Bagozzi et al., 2022). Meanwhile, existing research reveals the impact of using service robots, including the ability to improve the accuracy of service performance, avoid inefficient human contact (Lu et al., 2019); and meet customer differentiation needs.

To gain a deeper understanding of existing research, this paper searches the database for journal articles using the search terms "service robot", "artificial intelligence " and so on. Through preliminary literature search and screening, this paper finds that current research on service robots

has explored many aspects such as service robot technology and algorithms, research on customer perception, emotional communication, service experience, and consumer behavior. However, the existing research on the impact of service robots on customers and their impact mechanisms is scattered and lacks an overall logical framework. Based on this, this paper will take the impact of service robots on customers as a research theme, systematically review the current multidisciplinary research literature that focuses on this area, review the new characteristics of customers' attitudes, perceptions, intentions and behaviors after the use of service robots in the service industry today, and explore the new impact of the application of service robots on various areas of the service industry. The paper will present a detailed description of the external stimuli from service robots, as well as the variables of customers' mental processing and behavioral responses, and ultimately provides countermeasures and suggestions for enterprises to correctly promote and use service robots.

This paper contributes to the field of AI service robot research in the following three ways: First, it takes the three aspects of service robots' own characteristics, customer psychological mechanisms and behavioral responses as logical clues to start a literature review, providing a more complete research framework for the study of service robots' impact on customer psychology and behavior, and enabling scholars to gain a deeper understanding of the field of service robot marketing. Secondly, this paper combs and integrates relevant research on the impact of service robots on customers, which has to a certain extent enriched the research results in this field and provided scholars with more comprehensive research ideas in the field of artificial intelligence service marketing in the future. Thirdly, this paper helps companies to gain a deeper understanding of the factors related to the impact of service robots on customers, so as to maximise the positive effects of service robot inputs and increase customers' purchase intentions and behavior.

2. Features of the Services Provided by the Robot

2.1 Comparison of Service Characteristics of Robots and Human Employees

A summary and induction of the literature reveals that existing research defines service robots as system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organization's customers. (Wirtz et al., 2018). Since the process of providing services to customers unfolds based on an interpersonal interaction environment, most of the current research related to service robots follows the characteristics of interpersonal interaction services to explore. And existing research findings suggest that, compared to human services, robots have several characteristics.

Table 1. Comparison of service characteristics of service robots and human employees

	Service robots	Human employees
Mission performance	More capable than human beings in specific areas. 1) Improve the accuracy of performance and avoid inefficient human contact. 2) Can do some repetitive, standardised tasks. 3) Play an important role in the provision of "no contact services" after an outbreak.	Better performance in non-cognitive skills. 1) More emotional, social and personal skills. Most of these skills come from innate human characteristics such as interpersonal warmth, personality, and self-perception.
Social interaction	A unique advantage in terms of social interaction and contact. 1) It can be used as an interactive partner. 2) Helps to reduce contact, increase mental enjoyment and reduce possible psychological discomfort.	Perform better in interpersonal communication. 1) It can be used as a social partner. 2) More adept at interpersonal and social interaction with communication skills.
Task difficulty	Engage in simpler tasks. 1) In a predictable sequence of development, mechanical precedes analytical, analytical precedes intuitive, and intuitive precedes empathic intelligence.	Work on more complex tasks. 1) Because individual human experiences are unique, they rely on both emotional capacity and personal skills. Therefore it is possible to perform complex tasks.

	2) AI job replacement currently occurs largely at the task level, rather than the job level. Thus more engaged in simple tasks.	
Service Standards	The service is based on data and is programmed. (1) Empowered by technologies such as computerised voice processing systems, face recognition and big data analysis, service robots can better sense people's intentions and provide consumers with an efficient and convenient service experience, meeting their differentiated needs.	The service is based on time and effort and is non-programmed. 1) More time and energy is needed to manage non-programmed matters and provide a more complete and personalised service to consumers.
Unconventional consumption	It may lead to an increase in compensatory consumption. 1) Service robots can cause greater consumer discomfort, which in turn leads to increased compensatory consumption. 2) Interacting with the service robot also triggers more emotions.	It may lead to an increase in conspicuous consumption. 1) Compared to service robots will boost the propensity for showy consumer behavior. 2) Improving customer perceptions of subject responsibility.

2.2 Summary of Robot Service Features

The above comparison provides a clear understanding of the differences in service characteristics between service robots and human employees. However, with the development of artificial intelligence technology, service robots are being used in more and more service situations and are gradually becoming capable of providing services to customers independently, no longer relying on cooperation with human employees. Therefore, the following is a summary of the characteristics of service robots, which are divided into three points.

2.2.1 Data-driven, Diverse and Personalised Services

With the development of artificial intelligence technology, service robots are becoming more diverse in types and in the services they provide. On top of this, they are capable of autonomous decision making based on the data they receive by various sensors and other sources (i.e. the sense-think-act paradigm) and adapt to the situation, thus they can learn from previous episodes (Pagallo, 2013). Having superb big data processing and analysis capabilities allows service robots to understand customers better than human employees and use ultra-high predictive accuracy to increase customer loyalty during service delivery (Hui et al., 2018). This allows them to provide services that are relevant to different consumption contexts and different consumers, greatly enriching the consumer experience and meeting their differentiated needs, providing a data-driven, more personalised service to customers.

2.2.2 Energy Driven, Fast Service with Few Restrictions

At present, service robots are mostly supported by autonomous charging technology, which allows them to complete their work according to a set program as soon as charging is completed. Compared to other service methods, AI services are therefore less restricted by physical factors such as time and space, and can be provided at any time when battery capacity allows. Fethi and Pasiouras (2010) also show that thanks to their working hours that far exceed those of humans, service robots can improve the operational efficiency of businesses and improve the efficiency of management. As a result, the energy-driven services provided by service robots will be less restrictive and more responsive.

2.2.3 Program-driven, Poor Service Improvisation

Artificial intelligence services are program-driven, bringing them powerful data storage capabilities and extremely short service response times, but also causing them to be destined to rely on big data processing and analysis capabilities to classify service instructions in advance, refine the logical relationships between the instructions of the corresponding categories of service demands and pre-defined keywords, and complete logical and instructional judgments. This also results in its inability to provide services to demands outside of the established procedures, and makes it difficult to personalise responses when deviations in information transcoding and decoding content occur (Gan

et al., 2022). This reduces the service robot's ability to improvise in actual service situations and puts it at a disadvantage in unexpected situations.

3. Research Theory and Research Framework

The S-O-R model is a framework developed to explain individual behavioral responses based on stimulus-response theory, and consists of three related factors, namely stimulus, organism and response. The "stimulus" refers to the external environment that influences the individual's internal processing state; the "organism" refers to the individual's cognitive and affective state, reflecting the individual's mental processing of cues; and the "response" refers to the behavior associated with a particular stimulus. Using these three factors, the model explains how aspects of the external environment (stimuli) affect the individual's mental state (organism) and further determine the individual's behavioral intentions or actual behavior (responses) to external stimuli, revealing the mechanisms underlying the individual's behavioral responses.

Based on the prior combing and summarising of existing literature studies, this paper finds that S-O-R theory is very applicable to the study of the impact of service robots on customers in the following aspects: 1) As a prominent achievement in the development of artificial intelligence technology in recent years, the application of service robots in the service field has significant stimulus characteristics and produces internal and external dual stimuli to customers. 2) S-O-R theory provides a complete external environmental stress framework to explain individual behavioral responses, which fits with the context in which the customers in the study generated psychological cognitive and behavioral responses to the service robots. 3) Many existing relevant robot service studies are based on the stimulus and behavioral response paradigm and have a rich research base. In summary, the impact of service robots on customers is consistent with the pathway of external stimuli (use of service robots) - organismic mental processing (customers' cognitive and affective states) - response to stimuli (customers' resulting behavioral responses). Therefore, this paper will combine the S-O-R model and build an integrated theoretical research framework from the three dimensions of stimulus, organism and response, according to the inner logic of the model.

Specifically, in terms of stimulus factors, this will specifically include two aspects: the appearance of the service robot and the level of service. In terms of mental processing, the three aspects are cognitive level, emotional level and interaction level. In terms of stimulus response, this will specifically include the behavioral response of the customer to the service robot, which is divided into two dimensions: positive and negative.

3.1 The External Environment Affecting the Individual's Internal Processing State

3.1.1 Service Robot Appearance

The appearance of a service robot constitutes the primary stimulus for its impact on customers, and Wirtz et al. (2018) argue that the relevant appearance factors include image and anthropomorphic features. Appearance includes the voice, colour, material, etc. that the service robot is given. Anthropomorphic characteristics include not only a level of similarity in appearance to humans, but also a similarity to humans in terms of characteristics and capabilities. Söderlund et al. (2021) argue that existing service robots are similar to humans in the following ways: they may have names and genders; they communicate in natural language; they are interactive; and they can be used to establish information about customer requirements.

In terms of appearance image, Eyssel et al. (2012) found that male service robots will be perceived as more initiative; whereas female robots are perceived as more group-oriented. The novel sensory stimuli that the service robot's appearance image will generate for customers may stimulate rational or emotional related impressions of humans. It has also been shown that anthropomorphic appearance can enhance consumer trust in robots (Leite et al., 2013) and protect them from vandalism and humiliation (Rehm and Krogsager, 2013).

In terms of anthropomorphic traits, research has found that humans tend to be more comfortable when robots have human-like characteristics and abilities (Wang and Krumhuber, 2018). The human-like characteristics of service robots predispose customers to apply the norms of conversation with human employees to service robots (Aggarwal and McGill, 2007). Even very low levels of anthropomorphic appearance can prompt customers to treat robots in a human-like manner. Gan et al. (2022) found experimentally that even though the machine had anthropomorphic cues, people still saw the machine only as an 'object' and not as an anthropomorphic 'person', so customers could naturally and comfortably gaze at the robot, effectively reducing the "polite neglect" that can occur when human employees come into contact with customers.

At the same time, the impact of service robot anthropomorphism on customers has not been entirely positive, with one study finding that anthropomorphism, first introduced as a key dimension of the technology acceptance model, is a major determinant of consumer acceptance of service robots (Lu et al., 2019). As a result of the 'valley of terror effect', when customers come into contact with a very human-like robot, their reaction to the robot suddenly changes from familiarity to disgust (Mori et al., 1970). As the degree of anthropomorphism increases, consumers' willingness to use the robot increases and then begins to decline, i.e. there is an inverted U-shaped relationship. It has also been argued that while anthropomorphism enhances consumer perceptions of robot enthusiasm, it does not have a significant impact on perceptions of competence (Kim et al., 2019).

3.1.2 Service Robot Service Level

In terms of the functional attributes of the services provided by service robots, Bellis and Johar (2020) found in their study of self-service shopping systems that customers' motivations for using service robots included functional benefits, time and cost savings, and ease of use and convenience. Klaus and Zaichkowsky (2020) found that customers were motivated to use service robots due to the convenience of easy-to-use voice, the voice's sense of control and the positive emotion of the voice led them to choose to shop via smart speakers. This suggests that the service level of service robots in terms of functional attributes will have a significant impact on customers' willingness to use them.

At the same time, with the advent of the experience economy, consumers are paying more attention to service and product quality while also paying more attention to emotional needs, preferring service products that resonate with their psychological needs, which means that consumers are beginning to shift from focusing on the outcome of service delivery to focusing on the process experience of receiving the service (Hui et al., 2018). This also places a higher demand on the level of service provided by service robots. While existing AI still mostly exhibits its physical attributes during existing services, it is difficult to move away from its mechanistic service function attributes, and service robots that interact with customers rarely experience emotions (Gan et al., 2022), they can already be designed to have such functions and thus provide value-added services to customers (Söderlund et al., 2021).

Specifically, the adoption of service robots for service can help increase efficiency, reduce costs and improve customer potential (Belanche et al., 2020). In addition, service robots can co-create unique experiences with customers, adding value to the experience (Hoyer et al., 2020). Research by Söderlund (2022) suggests that service robots with more perceptual theory of mind can improve their perceived service quality, an effect mediated by perceived humanity and perceived usefulness associated with the service robot. The service robot's perceived ability to self-identify influences the perception of other service robot attributes and ultimately the overall quality of service provided by the service robot. This suggests that the theory of perceptual psychology will also influence the level of service provided by the service robot, and thus the customer.

3.2 The Cognitive and Emotional State of the Individual

3.2.1 Customer Awareness Level

The individual perception level, i.e. the customer's perception of the service robot, is one of the very important factors in research on the impact of service robots on customers. Existing research has

found that perceived usefulness and perceived ease of use, comfort and perceived efficiency, and level of perceived intelligence (Parry et al., 2012) influence users' acceptance of smart products.

Specifically, Lu et al. (2019) found that the use of service robots will enhance the ability to perform a task, i.e. perceived usefulness. A study by Chang et al. (2022) also found that higher customer satisfaction in functional service robots oriented towards exchange relationships was due to increased perceptions of the robot's capabilities. The level of perceived intelligence of consumers in lower social classes gradually decreases as the service robot becomes more anthropomorphic in appearance, while the level of perceived intelligence of consumers in higher social classes gradually increases, both of which have an impact on their willingness to use (Zhang and Wang, 2022). A study by Cui et al. (2022) found that an increased sense of customer power enhances an individual's self-efficacy when faced with a service robot, which in turn has an impact on subsequent behavior. Therefore, the types and levels of customer perceptions of service robots can be broken down into a number of aspects, all of which will have a significant impact on the behavior associated with the eventual use of service robots.

3.2.2 Customer Emotion Level

Richa et al. (2022) argue that AI not only extends the service economy, but also drives the shift to an emotional economy. Whereas AI in computer science is seen as a thinking machine for rational analytical decision-making, AI in services needs to become an emotional machine that serves the emotional needs of customers. It has also been found that among the multiple dimensions of using service robots, emotional value has the most significant impact on individuals' willingness to use them (Heijden, 2004). Therefore, understanding the level of customer emotions towards service robots will also help to explore the impact that the use of service robots has on customer behavior.

There may be demographic or cultural differences in customers' emotional perceptions of service robots (Egger et al., 2019). The findings of Abrardi et al. (2022) suggest that customer segmentation for new technologies should consider not only socio-demographic factors, but also structural factors such as service autonomy and risk, which can significantly influence customers' emotional responses to service robots. Therefore, understanding these differences is crucial for service robots to successfully communicate emotionally with different customers.

Specifically in terms of customer emotions, Eleonora et al. (2022) found that consumers' reactions to service robots can display different emotions. These positive and negative emotions can play an important mediating role between service robots and customer satisfaction, continued willingness and emotional attachment to the service provider.

3.2.3 Human-robot Interaction Level

With service robots becoming one of the most popular AI products in contemporary society, human-robot interaction has become an everyday form of interaction, and this new form of interaction is rapidly changing and reshaping people's perceptions of the world and technology (Xu, 2022). An important central assumption in the research on human-robot interaction is that we respond to service robots in a similar way to how we respond to humans (Epley, 2018). At the same time, existing human-robot interaction research has identified a number of attributes that humans evaluate in relation to AI and that positively influence their willingness to use them for service. Many of these attributes are the same as when the service provider is human, such as the performance of happiness (Söderlund et al., 2021), quality of interaction (Pelau et al., 2021) and trustworthiness (Singh, 2021). Therefore, studying the level of customer interaction with service robots is important to explore the impact that the use of service robots has on customer behavior.

At the same time, with the development of artificial intelligence and the spread of mobile networks, machines are becoming actors in the communication process, participating in information transfer and emotional interaction. On this basis, the relationship between humans and AI, or intelligent robots, is gradually moving beyond the traditional "owning-owning" logic to include interaction and emotional connections (Gan et al., 2022).

Specifically, Becker et al. (2022) showed that technology not only facilitates service interactions, but also leads them. Emotionally communicative service robots can provide highly engaging interactive service experiences. Mende et al. (2019) found that when customers interacted with service robots, they exhibited compensatory responses. This stems from the fact that human-robot interactions cause greater consumer discomfort, which in turn leads to increase compensatory consumption. There were also significant differences in individuals' tendency to show off their consumption behavior when faced with different types of service providers. When receiving services from a robot, consumers devote more attention to self-directed thinking and pay more attention to their true thoughts, and are therefore less likely to engage in external-focused conspicuous consumption behavior, while customers are more likely to disclose sensitive personal information to the service robot (Kim et al., 2022).

There are both positive and negative effects of human-robot interaction. The positive aspect is mainly that the customer sees the robot as a participant in a social activity during the interaction with the robot and establishes a social relationship with the robot (Groom et al., 2011). Emotions of joy, love, surprise, interest and excitement are evoked in the interaction. The negative dimension is manifested on the one hand when the customer is unable to use the service robot due to a malfunction, and more emotions are triggered when the service robot moves (Filiari et al., 2022). Meanwhile, Zamora (2017) through an analysis of qualitative data, found that subjects were more willing to disclose sensitive information when confronted with human employees (as opposed to service robots).

Related research found that consumers expressed varying levels of dissatisfaction with service failures caused by anthropomorphic (versus non-anthropomorphic) service robots, depending on their level of interdependent self-construal (high vs. low) and technical self-efficacy (high vs. low) in the presence of two false scenarios of service failure, namely social norm violation and technical failure (Giuliani et al., 2015). Process failures were more likely to cause customers to attribute blame to the robot than outcome failures, due to customers' perceptions that the robot had more control over process failures than outcome failures; facial expressions of angry emotions would also affect human-robot interactions, especially in unclear and cluttered environments. However, the angry faces of emotional service robots do not necessarily imply adverse effects when interacting with humans. On the contrary, negative emotions may have a moderating influence in collaborative tasks if activation is timely and adequate (Hornung and Smolnik, 2022). On the other hand, Nicole et al. (2022) have compared the differences between human and chatbot and human-human interactions in their study, found that humans are more open, outgoing, conscientious and sincere when interacting with people. It has also been argued that service robots make customers perceive higher risks compared to human employees. Therefore, how to make human-robot interaction as natural as human interaction is an important issue to be addressed in the field of human-robot interaction.

3.3 Customers' Behavioral Responses to Service Robots

The impact of the use of service robots on customer behavior can be specifically divided into two aspects, positive and negative. The positive aspect is that the use of service robots will likely increase customers' purchase intentions (Ling et al., 2021), brand loyalty and product dependence (Moriuchi, 2019), and make focused choices of brands (Liang et al., 2021). Negative aspects, on the other hand, mainly include the use of service robots may also reduce customers' willingness to purchase and reduce the length of communication (Luo et al., 2019), emerge unconventional consumption behaviors, etc. (Mende et al., 2019), users may reduce their willingness to adopt products when they have a high degree of autonomy (Schweitzer and Hende, 2016), develop resistance behaviors towards artificial intelligence etc. (Longoni et al., 2019). At the same time, a large part of the negative impact of service robots on customers also comes from service failure contexts, with research showing that service failure will significantly affect dissatisfaction with service robots among consumers with low technological self-efficacy (Arikan et al., 2023). And when the barrier to entry for access to robotic services is too high, it can make the process of purchasing a product time consuming and discourage

customers from using service robots. Thus, there are still many issues that need to be addressed in the penetration of AI into the service industry.

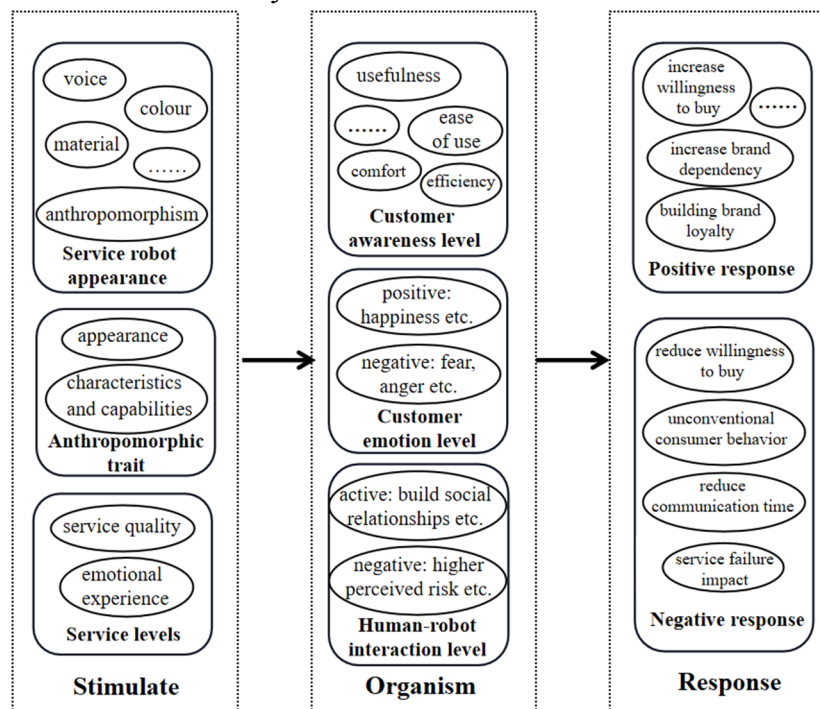


Figure 1. Integrated research framework on the impact of service robot use on customers in a 'stimulus-organism-response' model

3.4 Summary

In general, using the S-O-R theoretical framework as a basis to study the impact of service robots on customers, it can be found that: the appearance of service robots is an important external environment that affects the internal processing state of individual customers, and existing research can be divided into appearance and anthropomorphic features, which both affect customers' willingness to use service robots and their behaviour; the service level of service robots is also another important external environment that affects the internal processing state of individual customers, and with the further development of the experience economy, service robots are not only limited to providing functional services, but customers are also more likely to demand emotional services from them, which further affects customers' perception and behaviour; the individual customer's state under the stimulus of using the service robot can be divided into three parts: the cognitive level, the emotional level, and the human-robot interaction level, as the specific content and presentation state of the customer's mental processing of the service robot as a cue, which have a significant positive or negative impact on the use of the service robot from the perspective of the customer's internal reaction; in terms of customers' behavioral responses to service robots, the impact of the use of service robots on customer behavior will also be specifically divided into positive and negative aspects, taking into account the many aspects mentioned above.

However, the various components of the 'stimulus-organism-response' process could be further subdivided. For example, in the "Stimulate" section, in addition to the two main internal stimuli of the service robot appearance and service level, the external environmental features of the service robot, such as environmental smells, background music and other sensory experiences, can be further studied in detail; while in the "Organism" section, cognition, emotion and volition, as the three basic human mental activities, together form a complete and organic subjective consciousness system. In the 'Response' section, the reactions of customers to the behavior of service robots can be studied in more detail, as can the reactions to other subjects (e.g. to human employees, the surrounding environment, etc.).

At the same time, the existing research is still not sufficiently detailed in its examination of moderating variables, which can be broadly summarised into three areas: technological, individual and interaction variables. Future research could be targeted to explore antecedents, moderating variables and outcomes that are more appropriate for the impact of service robot use on customers.

4. Research Outlook

This paper presents a review of the literature using the three aspects of "stimulus-organism-response" as a logical clue, and provides an overview of the research on the impact of service robots on customers, enriching the research results in this field. As digitalisation and intelligence become the core force and key driver for enterprises to improve their competitiveness, the use of service robots in the service industry is becoming more and more widespread and diverse. In future research, more and deeper exploration can be done in the following areas.

First, in the context of the adoption of service robots, detailed research can be carried out on various factors: for example, from the point of view of appearance, the match between the distinctive markings of different service robots and different services can be studied in depth; from the point of view of service level, whether there is also a threshold where the quality and emotion of the services provided by service robots can lead to the "valley of terror", i.e. when the service quality and emotion of the service robot reaches a certain level, customer satisfaction is at its highest and beyond that level, the evaluation of the service robot declines rapidly in an inverted U-shape; in terms of human-robot interaction, how to present an appropriate cooperation between the service robot and human employees to achieve the highest value of customer satisfaction; in terms of behavioral response, how customers' reactions to other factors in the service robot context affect the behavioral responses of the service robot.

Secondly, the psychological mechanisms of customers when using service robots can be explored in more detail. Most of the existing research has focused on the cognitive and emotional changes that customers experience when using service robots, but less on the impact of using service robots on their own cognition and emotions. In the current era of digital intelligence, where self-awareness is becoming more and more prominent, it is important to study not only the customer's judgement of the service robot as an object, but also the customer's own thinking as a subject, such as the impact of using a service robot on the customer's self-judgement.

Thirdly, with regard to the use of service robots, there are significant differences in the development and application of industries between different countries, as well as differences in culture and concepts, so their customers' psychological mechanisms are bound to vary significantly. For example, in societies with a high level of uncertainty avoidance, such as Japan, customers are more cautious about technology products and therefore approach the use of service robots in marketing with more caution, while in societies with a low level of uncertainty avoidance, such as Singapore, customers are more willing to try and use new technology products. Most of the existing studies have been conducted in one country or region, and there are few cross-cultural comparisons between countries. Therefore, in the future, comparative studies could be conducted on the use of service robots in different economic systems and cultural contexts.

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