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Driving Innovation: Exploring What Influences Restaurant Customers' Perception and Adoption of Service Robots in Chengdu, China

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Abstract

Purpose: This paper investigates the crucial factors of service robots' significant impact on restaurant customers' perceived usefulness and intention to use them in Chengdu, China. The conceptual framework provided cause-and-effect correlations between perceived ease of use, perceived usefulness, social image, ability, anthropomorphism, autonomy, and intention to use. **Research design, data, and methodology:** Restaurant customers in Chengdu, China's national center city, were given the questionnaire by the researcher using a quantitative method (n=500). Non-probability sampling techniques encompassed judgmental sampling, which was used to choose four hot pot and Sichuan cuisine restaurants; quota sampling, which defined the sample size; and convenience sampling, which was used to gather data and send questionnaires online. The investigator carried out the data analysis, including model fit, reliability, and construct validity, using structural equation modeling (SEM) and confirmatory factor analysis. **Results:** The findings indicated that perceived usefulness providing the greatest consequence on Intention to use. Perceived ease of use, social image, ability, anthropomorphism, and autonomy used perceived usefulness as an intermediate variable to influence restaurant customer's intention to use. **Conclusions:** Organizations, managers, and stakeholders in service robots must focus more on perceived ease of use, usefulness, social image, ability, anthropomorphism, and autonomy using automated systems, which enhance the Intention to use robotic restaurants.

Keywords: Service Robot, Perceived Ease of Use, Perceived Usefulness, Social Image, Intention to Use

JEL Classification Code: E44, F31, F37, G15

1. Introduction

ISO 8373:2012 defines a robot as an "acting device configurable in more than one axis with an appropriate level of autonomy, traveling throughout its surroundings to carry out planned objectives." Based on its planned use, the robot is classified as either an industrial robot or a service robot.

Robots are becoming increasingly commonplace in human-centered workplaces, and they have the potential to help humans in everyday situations. According to Epley et al. (2007), this robot feature can meet social demands, which makes it crucial for those who require more engagement. According to Bartneck et al. (2009), robot features are

crucial mediators in explaining how anthropomorphism transforms into future usage intention.

Like the manufacturing sectors experienced an industrial boom in the late 1700s when machines and technology were used to produce goods at lower prices and provide relief from taxing physical work, the global economy is moving through a service revolution. Robots and artificial intelligence rapidly develop smart technologies, revolutionizing all service industries (Wirtz et al., 2018). Due to them, autonomous machinery has progressed from "dumb devices that carry out menial, monotonous duties to the intelligent, smart anthropomorphic robots"—robots that mimic communications with customers in a service setting by looking like humans and having social abilities (Breazeal,

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2003). We refer to these as service robots.

Service robots are “autonomous devices capable of operating and performing services without continuous human guidance” (Huang et al., 2021). Many kinds of robotic equipment that assist people are called service robots (Bowen & Morosan, 2018). According to Xiao and Kumar (2019), their qualities significantly impact people’s interactions with service robots. For service robots, anthropomorphism and autonomy are the two most important and distinctive features (Marinova et al., 2010). To increase the tendency of individuals to engage, confidence, and feelings of attachment, anthropomorphism emphasizes human-like characteristics. Research indicates that workers who interact with humanoid robots exhibit a more positive disposition, a greater desire to collaborate, and superior job outcomes than those who work with mechanical robots. Robots with greater autonomy can complete challenging jobs and react to different situations with fewer resources from humans, making them more useful, intelligent, and enjoyable to collaborate with as collaborators (Yang et al., 2016).

Globally, and particularly in the United States and China, the usage of service robots in providing hospitality services has been growing rapidly. For instance, China employs AI robots to do lodging functions, including meal delivery and preparation, check-in and check-out, and housekeeping (Insider, 2019); several hotels in Shanghai employ AI robot servers capable of communicating multiple languages (Holley, 2019). Artificial intelligence (AI) service robots have been deployed at the Beijing 2022 Winter Olympics to serve meals, clean athletes’ accommodations, and even mix drinks (Carroll, 2022).

China is now the second-largest service robot producer in the world, with 106 businesses producing service robots as of 2022. Sales of professional service robots for public spaces in broad indoor settings increased by 78% to about 37,300 units. Many of these robots are designed for restaurant food and drink delivery. Statistics show that between 2018 and 2022, the market for service robots in China went from being dominated by household service robots to being predominated by business service robots. The market’s total value increased from 11.78 billion yuan to 40 billion yuan, with the main drivers of this transition being consumer interest in the public sector, like education and catering services, as well as other areas.

Consequently, the researcher considered that restaurant customers’ inclination to use service robots is pivotal for the sustained success of artificial intelligence in China. This study aimed to investigate the factors that influence users’ perceived usefulness and intentions to use service robots in four restaurants in Chengdu, China, foster organizational growth, and serve as a valuable resource for future researchers in this domain.

2. Literature Review

2.1 Perceived Ease of Use

According to TAM, the adoption of computer technologies is primarily influenced by two key principles: perceived usefulness and perceived ease of use (Davis et al., 1989). The impact of perceived ease of use on perceived usefulness, as per TAM, is a crucial insight. It suggests that the more user-friendly a system is, the more valuable it becomes. Consumers, as (Venkatesh & Bala, 2008) argue, can gauge their likelihood of achieving their high-level objectives (i.e., perceived usefulness) based on their experience of the low-level behaviors (i.e., perceived ease of use). TAM3 further supports this, showing that the influence of perceived ease of use on perceived usefulness increases with expertise (Venkatesh & Bala, 2008).

The views of consumers toward robots are favorable, according to (Abou-Shouk et al., 2021), because of the way they work (perceived usefulness), efficiency, and ease of use (PEOU) in hotels (Guan et al., 2022). Perceived ease of use of service robots was shown to have a greater influence on perceived usefulness than reported enjoyment of the robots, according to Park and Del Pobil (2013). Several studies examined the contingent relationship between perceived ease of use and perceived usefulness. They developed the hypothesis that perceived ease of use significantly affects perceived usefulness, manifested in the following hypotheses.

H1: Perceived ease of use has a significant impact on perceived usefulness.

2.2 Social Image

In addition to any performance improvements directly related to system use, an individual may believe that utilizing a system would boost their professional performance (which is the definition of perceived usefulness) indirectly owing to social image improvement. According to TAM2, social image will positively impact perceived usefulness by using integration and recognition procedures. According to Venkatesh and Bala (2008), users’ judgments of social image and subjective norm—two crucial factors influencing perceived usefulness—can be influenced by managerial support. At all three assessment stages, there was a substantial relationship between social image and perceived usefulness (verification) (Venkatesh & Davis, 2000).

In this instance, a community of individuals’ cooperative utilization of the highly perceived usefulness of robot technology produces a social image that fosters esteem for the individual who uses it (Rejón-Guardia et al., 2020; Venkatesh & Bala, 2008). According to Rejón-Guardia et al. (2020), social image significantly positively impacts

perceived usefulness. They noted that the absence of social image's influence as a driver of adoption suggests that individuals' choices to adopt robots are mostly influenced by their own experiences and social perception rather than being heavily influenced by social image. Based on the above literature, the following research hypotheses emerged from this paper.

H2: Social image has a significant impact on perceived usefulness.

2.3 Ability

Gao et al. (2023) examined how consumer preparedness for ability affects how AI impulses affect consumer participation and co-creation. Consumer ability may impact the dependent variable through its influence on the independent variable. They discovered, which is a novel viewpoint and understanding, that consumer ability may greatly enhance the impact of customer engagement in the interaction between humans and AI procedures.

Li et al. (2023) found that in an experience service situation, consumer ability has a favorable impact on perceived usefulness; in a credence (as opposed to experience) service environment, the ability may have a harder time favorably influencing customers' perceived usefulness. Their methodology placed a strong emphasis on the ability and clarity of the consumer as crucial components. Consumers' beliefs about their capacity to communicate with a service robot typically correlate positively with their real ability and prior knowledge (Meuter et al., 2005). Li and Wang (2021) showed that perceived usefulness is strongly correlated with ability. Based on the above literature, the following research hypotheses emerged from this paper.

H3: Ability has a significant impact on perceived usefulness.

2.4 Anthropomorphism

Blut et al. (2021) stated that anthropomorphism is an important concept for comprehending how people react to robots. They discovered that comprehension of anthropomorphism's working mechanism requires an awareness of the two functional mediators—usefulness and ease of use—proposed by technology acceptance research. Anthropomorphism does not cause negative emotion and is favorably correlated with crucial outcomes such as usefulness and ease of use.

Epley et al. (2007) suggested that anthropomorphism plays a significant role in enhancing the perceived usefulness of robots. They proposed that encouraging anthropomorphism can boost a person's feeling of effectiveness, thereby improving their relationship with a robot. Additionally, anthropomorphism can enhance the perceived usefulness of the robot by making it feel more

socially related. Most of the research supports these beneficial effects of anthropomorphism on perceived usefulness, underscoring its practical implications in human-robot interaction.

H4: Anthropomorphism has a significant impact on perceived usefulness.

2.5 Autonomy

Autonomy is one of the ways AI robots vary from mechanical ones, which could provide a feeling of innovation (Warren & Campbell, 2014). Li and Wang (2021) highlighted the service robot's autonomy as a key component of their concept. Li et al. (2023) found that rather than impacting perceived ease of use, autonomy in the experiential service environment positively influences consumers' attitudes and behavioral intention toward the service, influencing perceived usefulness.

Huang et al. (2021) found that perceived usefulness and autonomy are the two main mental sensations representing service robots' technical features. Hotel service robots are significantly impacted by safety, mimicry, autonomy, and scalability, as demonstrated by the modeling of the relationship between humans and them (Jia et al., 2021). Lucia-Palacios and Pérez-López (2021) demonstrated that the relationship between autonomy and perceived usefulness is quadratic, with a stronger relationship at high degrees of autonomy. Based on the above literature, the following research hypotheses emerged from this paper.

H5: Autonomy has a significant impact on perceived usefulness.

2.6 Perceived Usefulness

TAM postulates that two beliefs—perceived usefulness and perceived ease of use—determine a person's behavioral intention to utilize a system (Davis, 1989). One of the most significant distinctions between TRA and TAM is the presence of behavioral intention to use. The behavior most closely precedes an individual's real action is their behavioral intention to use (Davis, 1989; Davis et al., 1989; Sheeran, 2002). Furthermore, attitudes toward technology and gadgets, as well as perceived usefulness, greatly impact behavioral intention to use.

Li et al. (2023) found that consumers' behavioral intention to use the service robot could be enhanced by favorably impacting perceived usefulness. Heerink et al. (2009) found that the perceived usefulness of a service robot greatly impacted consumers' intentions to use it. Ezer et al. (2009) observed similar patterns across a range of aged populations. The users' desire to feel like they fit in, which is summed up by their perceptions of the robots' usefulness and ease of use, determined their intention to use service robots

(Park & Del Pobil, 2013). They discovered that one of the key factors influencing users' intentions to use the service robots was their perceived usefulness of the robots. Based on the above literature, the following research hypotheses emerged from this paper.

H6: Perceived usefulness has a significant impact on intention to use.

2.7 Intention to Use

Warshaw and Davis (1985) defined intention as the choice of whether or not to carry out a certain subsequent action. Huang et al. (2023) referred to the intention to use service robots as consumer acceptance of them. Intention to use indicates how much a user intends to utilize computers in the future (Davis, 1989). Consumers find service robots in restaurants pleasurable, and they are more likely to have the intention to use service robots if they believe the robots are dependable. They do not have worries about missing or lost food (Yang et al., 2016). Intentions to use technology are positively associated with novelty (Fazal-E-Hasan et al., 2020).

3. Research Methods and Materials

3.1 Research Framework

The research cited three underlying theories: the Technology Acceptance Model (TAM), designed by Davis et al. (1989); the Role Theory (RT), designed by Solomon et al. (1985); and the Technology Acceptance Model 3 (TAM3), designed by Venkatesh and Bala (2008). Based on this knowledge, the researcher created the conceptual framework for this investigation, as shown in Figure 1.

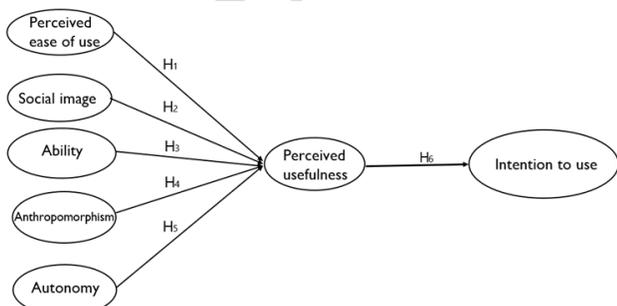


Figure 1: Conceptual Framework

H1: Perceived ease of use has a significant impact on perceived usefulness.

H2: Social image has a significant impact on perceived usefulness.

H3: Ability has a significant impact on perceived usefulness.

H4: Anthropomorphism has a significant impact on perceived usefulness.

H5: Autonomy has a significant impact on perceived usefulness.

H6: Perceived usefulness has a significant impact on intention to use.

3.2 Research Methodology

By using a quantitative method of non-probability sampling, the researcher distributed questionnaires to the target population through an online questionnaire platform (Bartneck et al., 2009). The target population for this study was restaurant customers from four hot pot and Sichuan cuisine restaurants in the capital city of Sichuan Province. We examined the customer feedback data to investigate the causes that influence restaurant customers' perceived usefulness and intention to use service robots. There were three sections on the questionnaire for this investigation. Screening questions made up the first segment. In the second part, every variable was rated on a 5-point Likert scale. The scale items have evaluated the six study hypotheses. From (1) strongly disagree to (5) strongly agree, they were the range of measures. The third sections were demographic questions. These questions included gender, age, level of education, profession, and times with service robots in restaurants. The researcher gave 35 respondents a pilot test before distributing the main questionnaire. The expert's Item-Objective Consistency Index (IOC) score for the pilot test questionnaire was satisfied.

3.3 Population and Sample Size

The validity and reliability assessments of the study's questionnaire were completed using Cronbach's Alpha technique (Hartog & Verburg, 2010). After distributing the questionnaires to the targeted respondents, the investigator obtained 500 satisfactory answers. We examined the provided feedback data using SPSS AMOS statistical methods. We employed confirmatory factor analysis (CFA) to evaluate the convergence's validity and accuracy. These measurements guaranteed the reliability and validity of the model and confirmed that the conceptual framework of the research suited the data. Through those efforts, the researcher used structural equation modeling (SEM) to explore the causal connections between the studied variables.

3.4 Sampling Technique

The investigator chose four hot pot and Sichuan cuisine restaurants in Chengdu, the national center city of Sichuan Province, China, and used non-probability sampling, judgmental sampling, and quota sampling. They will then

distribute surveys using an internet platform. The particular sampling for this investigation is shown in Table 1.

Table 1: Sample Units and Sample Size

Restaurants	Population Size	Proportional Sample Size
Rongshenghe hot pot (Xihua University Restaurant)	355	125
Rongshenghe hot pot (Longchengguoji Restaurant)	286	101
Rongshenghe hot pot (Xipu Restaurant)	469	165
Huangshi Cabbage Root Fragrance (Hongguang Restaurant)	308	109
Total	1418	500

4. Results and Discussion

4.1 Demographic Information

Demographic information collected from participants was based on gender, age, level of education, the profession of the customers, and the times they had experience with service rotors in the restaurants. We distributed questionnaires to 500 customers in four hot pot and Sichuan cuisine restaurants in the capital city of Sichuan Province. Of the respondents, there were 274 females and 226 males, accounting for 54.8% and 45.2% respectively. There were 86 (17.2%) customers between the ages of 18 and 25, 126 (25.2%) customers between the ages of 26 and 35, 131 (26.2%) customers between the ages of 36 and 45, 119 (23.8%) customers between the ages of 46 and 55, and 38 (7.6%) Above 56 years old. According to the level of education, 8.6% of customers have less than a high school degree, 22.2% of customers have a high school degree, 11.2% of customers have an Associate degree, 40.2% of customers have a Bachelor's degree, 15.2% of customers have a Postgraduate Degree, 2.6% customers belongs other situation. By profession, 18.4% of customers are students, 33.6% are company staff, 25.6% are Staff of parties, government, or public institutions, and 22.4% of customers are others. There 38 (7.6%) customers had experience with service robots in a restaurant 1-2 times, 111 (22.2%) customers had experience with service robots in a restaurant 3-4 times, 126 (25.2%) customers had experience

with service robots in restaurant 5-6 times, and 225 (45%) customers had experiences with service robots in a restaurant more than six times. Table 2 presents demographic information for this study.

Table 2: Demographic Profile

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Female	274	54.80%
	Male	226	45.20%
Age	18 to 25 years old	86	17.20%
	26 to 35 years old	126	25.20%
	36 to 45 years old	131	26.20%
	46 to 55 years old	119	23.80%
	Above 56 years old	38	7.60%
Level of education	Less than high school degree	43	8.60%
	High school degree	111	22.20%
	Associate degree	56	11.20%
	Bachelor's degree	201	40.20%
	Postgraduate Degree	76	15.20%
	other	13	2.60%
Profession	Student	92	18.40%
	Company staff	168	33.60%
	Staff of party, government or public institutions	128	25.60%
	Others	112	22.40%
	Times with service robots in restaurant	1 - 2 times	38
3 - 4 times	111	22.20%	
5 - 6 times	126	25.20%	
More than 6 times	225	45.00%	

4.2 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) was utilized in this research to quantify every variable in the conceptual framework. The measurement's findings demonstrated the significance of each item on the scale associated with each variable. Furthermore, every scale item's factor loading values were within acceptable boundaries, suggesting that the research's conceptual framework was a suitable fit. For this investigation, all construct reliabilities were more than 0.70, all mean extracted variances were higher than 0.50, all p-values were below 0.05, and all factor loading values were better than 0.30. Every one of these estimations was noteworthy. Table 3 displayed every one of these information values.

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
Perceived Ease of Use (PEU)	Park and Del Pobil (2013)	4	0.866	0.725-0.824	0.867	0.621
Social Image (SI)	Said et al. (2023)	3	0.849	0.789-0.800	0.849	0.653
Ability (AB)	Li et al. (2023)	3	0.870	0.780-0.869	0.871	0.693
Anthropomorphism (ANT)	Li et al. (2023)	5	0.889	0.755-0.823	0.889	0.616

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
Autonomy (AU)	Li et al. (2023)	3	0.846	0.780-0.842	0.846	0.647
Perceived Usefulness (PU)	Park and Del Pobil (2013)	4	0.889	0.797-0.843	0.889	0.667
Intention to use (ITU)	Park and Del Pobil (2013)	4	0.902	0.814-0.867	0.902	0.698

Table 4 shows the square roots of the extracted level differences, and the results suggest that every variable in the research had suitable correlations. This study employed GFI, AGFI, NFI, CFI, TLI, and RMSEA as measures of model fit in the CFA test.

Table 4: Goodness of Fit for Measurement Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	< 3.00 (Hair et al., 2006)	1.071
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.957
AGFI	≥ 0.85 (Schermelleh-Engel et al., 2003)	0.946
NFI	>0.90 (Hair et al., 2006)	0.961
IFI	>0.90 (Hair et al., 2006)	0.997
TLI	>0.90 (Hair et al., 2006)	0.997
CFI	>0.90 (Hair et al., 2006)	0.997
RMSEA	< 0.05 (Hu & Bentler, 1999)	0.012
Model Summary		Acceptable Model Fit

Remark: CMIN/DF = the ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, IFI = Incremental Fit Indices, TLI = Tucker Lewis index, CFI = comparative fit index and RMSEA = root mean square error of approximation

Table 5 displays the convergent validity and discriminant validity for this research. The acceptability of these two values was confirmed. All measurements confirmed the validity of the structural model derived in this investigation.

Table 5: Discriminant Validity

	PEU	SI	AB	ANT	AU	PU	ITU
PEU	0.788						
SI	0.296	0.808					
AB	0.343	0.290	0.832				
ANT	0.242	0.242	0.282	0.785			
AU	0.340	0.247	0.296	0.320	0.804		
PU	0.432	0.376	0.452	0.345	0.381	0.817	
ITU	0.304	0.367	0.328	0.283	0.295	0.464	0.835

Note: The diagonally listed value is the AVE square roots of the variables
Source: Created by the author.

4.3 Structural Equation Model (SEM)

According to Hair et al. (2006), model fit metrics should have a Chi-square/degrees-of-freedom (CMIN/DF) ratio lower than 3.00. According to Sica and Ghisi (2007), the GFI needs to be at least 0.85. According to Schermelleh-Engel et al. (2003), the AGFI needs to be at least 0.85. According to Hair et al. (2006), the NFI, IFI, TLI, and CFI should be higher than 0.90. According to Hu and Bentler (1999), the

RMSEA was less than 0.05. The investigators performed the SEM computations using SPSS AMOS version 28. The research's fit index findings demonstrated a satisfactory match. CMIN/df = 2.175, GFI = 0.895, AGFI = 0.874, NFI = 0.916, IFI = 0.953, TLI = 0.947, CFI = 0.953 and RMSEA = 0.049. Table 6 displays these values.

Table 6: Goodness of Fit for Structural Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	< 3.00 (Hair et al., 2006)	2.175
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.895
AGFI	≥ 0.85 (Schermelleh-Engel et al., 2003)	0.874
NFI	>0.90 (Hair et al., 2006)	0.916
IFI	>0.90 (Hair et al., 2006)	0.953
TLI	>0.90 (Hair et al., 2006)	0.947
CFI	>0.90 (Hair et al., 2006)	0.953
RMSEA	< 0.05 (Hu & Bentler, 1999)	0.049
Model Summary		Acceptable Model Fit

Remark: CMIN/DF = the ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, IFI = Incremental Fit Indices, TLI = Tucker Lewis index, CFI = comparative fit index and RMSEA = root mean square error of approximation

4.4 Research Hypothesis Testing Result

The investigator determined the research model's significance depending on every variable's regression weights and R2 variances. The computation results are shown in Table 7. These findings validated the entirety of the study's assumptions. Perceived Ease of Use influenced Perceived Usefulness ($\beta=0.278$), Social Image influenced Perceived Usefulness ($\beta=0.229$), Ability influenced Perceived Usefulness ($\beta=0.318$), Anthropomorphism influenced Perceived Usefulness ($\beta=0.180$), Autonomy influenced Perceived Usefulness ($\beta=0.207$) and Perceived Usefulness influenced Intention to use ($\beta=0.492$).

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: PEU→PU	0.278	5.871*	Supported
H2: SI→PU	0.229	4.838*	Supported
H3: AB→PU	0.318	6.627*	Supported
H4: ANT→PU	0.180	3.938*	Supported
H5: AU→PU	0.207	4.406*	Supported
H6: PU→ITU	0.492	9.697*	Supported

Note: * $p < 0.05$

Source: Created by the author

According to the results in Table 7 the researcher concluded that perceived ease of use, with a criteria coefficient value of 0.278 in its structure route, constituted one of the primary factors of perceived usefulness, according to the construction of H1. Social image, with a criteria coefficient value of 0.229 in its structure route, constituted one of the primary factors of perceived usefulness, according to the construction of H2. Ability, with a criteria coefficient value of 0.318 in its structure route, constituted one of the primary factors of perceived usefulness, according to the construction of H3. Anthropomorphism, with a criteria coefficient value of 0.180 in its structure route, constituted one of the primary factors of perceived usefulness, according to the construction of H4. Autonomy, with a criteria coefficient value of 0.207 in its structure route, constituted one of the primary factors of perceived usefulness, according to the construction of H5. Perceived usefulness, with a criteria coefficient value of 0.492 in its structure route, constituted one of the primary factors of Intention to use, according to the construction of H6.

5. Conclusion and Recommendation

5.1 Conclusion

The objective of this study was to thoroughly examine the impact of service robots on restaurant customers' perceived usefulness and intention to use them in Chengdu, China. 2014, the report "China Restaurant Introduced Robot Waiters" was published. Nowadays, China is the world's second-largest producer of service robots, with 106 enterprises producing service robots as of 2022. Consequently, a thorough investigation of the mechanisms and variables impacting restaurant customers' perceptions of service robots' usefulness and intention to use them was required. This research has proposed six hypotheses that investigated the connections among the components.

The target population of this study was restaurant customers in Chengdu, China. This paper surveyed a national central city, Chengdu, Sichuan Province, China. We administered questionnaires to 500 restaurant customers with service robot experience in Chengdu from the four hot pot and Sichuan cuisine restaurants. The information gathered from these survey replies was examined. The data analysis supported the conceptual foundation of this article. This conceptual framework was informed by prior pertinent material. According to previous studies in this area, we employed perceived usefulness as a mediating factor

affecting consumers' intention to use service robots (Park & Del Pobil, 2013). The research's 500-point data set satisfied the JAMOVI and SPSS measurement analyses. The conceptual framework used in this research verified the item factor structure and met the AMOS examination. The CFA verified that this research's factor structure and validation model were appropriate and that there was a fair match between the relevant data (West, 2002).

The confirmatory factor analysis (CFA) assessment was approved based on the information gathered by the investigator via the 500 surveys. These findings showed that the research's conceptual model was sound and passed the validity and reliability tests. The notion of this research holding was demonstrated by the outcomes of the convergent validity tests, which included composite reliability, Cronbach's alpha reliability, factor loading, and mean-variance extraction analysis, and discriminant validity (Steigenberger, 2015). This study's structural equation modeling (SEM) was used to analyze the impact of service robots on restaurant customers' perceived usefulness and intention to use them in Chengdu, China. These findings proved the validity of the study hypotheses put forward in this work. They validated all six of the research hypotheses in this study.

According to the results of this investigation, first of all, ability had the strongest significant influence on perceived usefulness. Perceived ease of use demonstrated the second major impact on perceived usefulness. Social image and autonomy had a third-rank and fourth-rank impact on perceived usefulness, with little difference in standardized path coefficients. Comparatively speaking, although anthropomorphism influences perceived usefulness, its impact is minimal. This means customers' ability to use service robots, the perceived ease of use of service robots makes customers feel, the social image formed by customers, the degree of automation possessed by contemporary service robots, and the degree of anthropomorphism of service robots, which are increasingly paid attention to by customers, created influence customers' perceived usefulness. This impact is direct and significant.

Secondly, the results showed that perceived usefulness exhibited the greatest influence and directly affected the intention to use it in this quantitative survey. On the other hand, the five variables of perceived ease of use, social image, ability, anthropomorphism, and autonomy have certain indirect effects on intentional use, too. The above means that in order to improve the market sales of service robots further and expand the scope of use of service robots, it is necessary to continuously optimize and develop a more automatic, efficient, and anthropomorphic service robot design scheme to continuously deepen customers' feelings of easy use of service robots and their confidence in the self-ability of using

service robots. Fully enable customers to realize the positive promotion effect of using service robots on the management of social image, to continuously strengthen the perceived usefulness of service robots for customers, so that the service of service robots will be taken as a priority factor in the selection of restaurants.

5.2 Recommendation

Based on the findings of this paper, we recommend the following. Firstly, restaurant managers should have multiple attributes of service robots before deploying them. These include service robots' functional, social, emotional, and visual aspects. Among them, social image (as a social meaning), which is rarely mentioned in previous studies on service robots, is one of the determinants of adoption, which means that in today's information technology era, the adoption of robots is not only a personal decision, but is driven by personal experience and social identity. Therefore, restaurants should focus on advertising and marketing service robots, especially for specific customers who like to use innovative things.

Secondly, the designer of service robots should consider the anthropomorphic aspect of service robot design; technicians can apply optimistic expressions to the service robot's face to improve anthropomorphism (Chuah & Yu, 2021). Although anthropomorphism has some influence on customers' willingness to use it, the influence is very small. This suggests that when designing service robots, emphasis should be placed on the anthropomorphism of service robots so that they are perceived as more humane, safer, and more intelligent. However, at the same time, we should consider the production funds that need to be invested in strengthening these service functions and effectively control the cost price of service robots so that more restaurants can accept their prices and let the catering market widely adopt them.

Thirdly, because ability has the greatest impact on perceived usefulness, and perceived usefulness has a significant direct effect on the intention to use service robots, we suggest that in a service environment, management ought to concentrate on improving the ability of customers to enhance their inclination to utilize service robots. For instance, a manual, language prompt, or helper can further enhance customers' perceived abilities. Therefore, restaurants using service robots should also be equipped with some human waiters with strong expression ability, good service attitude, and understanding of service robots' use.

5.3. Limitation and Further Study

The study's limitations were the individual level of the variables in this study and the use of centralized data for

measuring them. Patrons of particular eateries supplied these statistics. Further research might benefit from including characteristics comparable to those examined in this research, using an interventional or continuous design, and consistent data collection at several periods.

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