Research on Users' Trust of Chatbots Driven by AI: An Empirical Analysis Based on System Factors and User Characteristics

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Abstract—AI chatbots have been widely used in e-commerce, which can improve service efficiency and reduce labor cost markedly. However, consumers' evaluation of intelligent customer service is mixed. This paper explores the impact of system factors and user characteristics on service perception and users' trust. Based on the social presence theory, this study constructs the trust research model of AI chatbots. The main results show that perceived personalization, perceived media richness and past usage experience positively influence social presence, cognitive reactance has a negative impact on social presence, social presence has a positive impact on users' trust. By investigating the features influencing trust, this study provides relevant technical improvement and marketing suggestions for managers.

Keywords-AI chatbots;system factors; user characteristics; trust; social presence

I. INTRODUCTION

The application of artificial intelligence is fundamentally changing the way service providers interact with consumers. AI applications can provide human-like service to consumers autonomously, and facilitate behavior prediction and recommendations, with limited or no human support [1]. In the field of e-commerce, AI chatbots are used widely in the service frontline. The AI chatbots system is technology-enabled, evaluating real-time service scenarios using data collected from digital and/or physical sources in order to provide personalized recommendations, alternatives, and solutions to customers' enquiries or problems, even very complex one [2].

Chatbots have brought great benefits to service providers, they can reduce the cost and improve the efficiency by handing over the repetitive and tedious work to AI. Such as Alibaba's Ali Xiaomi, eBay's shopBot and Amazon's echo, the combination of intelligent customer service and artificial customer service is the main way of e-commerce companies to provide consultation services for consumers, which can improve their service efficiency at the same time. However, consumers are more willing to contact with human beings and generally resist chatbot technology. People's evaluation of AI tools is mixed, and most consumers can hardly hold a firm standpoint on whether to accept or reject AI devices and robots

[3]. One reason might be that the development of chatbots is driven more by technology than by the market; therefore, the system lacks attention to the needs of users.

Although some scholars have investigated the consumer trust of AI tools in the past, few researches study about users' trust of AI chatbots in e-commerce. Based on the characteristics of human-computer interaction, this paper adopts social presence to measure user experience. The research introduces perceived personalization and perceived media richness from the perspective of system design, introduces psychological reactance and past usage experience from the perspective of user characteristics. Through empirical research, this paper provides suggestions for improving user service experience and AI chatbots system design, so as to promote the development of related industries which probably apply the intelligent customer service to service frontline.

II. LITERATURE REVIEW

A. Review of AI Chatbots Research

In addition to e-commerce, AI chatbots provide with automatic customer service, intelligent marketing, content navigation, intelligent voice control, entertainment chat and other services in many fields such as financial services, e-government and education. The current researches mainly focus on the user's intention and motivation to use the chatbots. Scholars have used some theories and models to research, such as expectancy theory, TAM, ECM, ISS, U&G theory and so on. In recent years, scholars have focused on the impact of anthropomorphism on the adoption intention. The anthropomorphic chatbots may satisfy the social desires of consumers high in need for human interaction [4]. Some scholars also discussed the situation of service failure [5]. It can be seen from previous researches that chatbot is a new technology as the artificial intelligence product.

B. Social Presence Theory

Short et al. proposed social presence and believed that social presence refers to the degree which a person is regarded as a "real person" and the perception degree to connect with others in the communication process through media [6]. In the

field of e-commerce, social presence plays an important role. The lack of direct face-to-face interaction in the virtual environment makes it particularly important for consumers to experience the feeling of being present. A strong sense of social presence during human-computer interaction is regarded as the ultimate goal of designing social interactive robots, scholars have confirmed that social presence plays an important role in shaping users' evaluation, social response, and attitude toward the technology. [7].

III. HYPOTHESES DEVELOPMENT AND CONCEPTUAL MODEL

A. Perceived Personalization

The basic idea of personalization is to deliver personalized information to the receivers according to their unique preferences. Perceived personalization is an important standard to evaluate service quality. When the information receiver considers the information as personalized information, it will have a positive impact whether the information is actually personalized or not [8]. Hong Zhang et al. have confirmed that perceived personalization has a positive impact on customers' virtual experience and generates social presence in social commerce [9]. Therefore, the research proposes:

Hypothesis 1: when using AI chatbots, the user's perceived personalization has a positive impact on social presence.

B. Perceived Media Richness

Media richness refers to the potential information carrying capacity of media. Rich media can overcome different knowledge backgrounds, expound the undefined problems clearly, so that both sides of the communication can reach a consensus [10]. Some scholars in the field of distance education have proved that media richness has a positive impact on social presence [11]. Therefore, the research proposes:

Hypothesis 2: when using AI chatbots, user's perceived media richness has a positive impact on social presence.

C. Past Usage Experience

Previous scholars have verified the moderating effect of usage experience on use intention [12], and the research on mobile instant messaging tools shows that past usage experience has a positive impact on social presence [13]. When users accumulate more experiences on how to use the intelligent customer service, they can achieve more effective communication with the AI chatbots. Therefore, the research proposes:

Hypothesis 3: when using AI chatbots, user's past usage experience has a positive impact on social presence.

D. Psychological Reactance

Psychological reactance refers to people believe that they have control over their own behavior. Therefore, when the freedom of control is limited, people often take countermeasures to protect their freedom [14]. Consumers are reluctant to adopt intelligent customer service because they always have to deal with this process first when there are

special consulting needs. Such compulsory adoption may cause consumers to exert psychological reactance toward the AI chatbots. This paper refers to the studies of Dillard [14] and Wenting Feng [15] to divide psychological reactance into two dimensions: emotional reactance (negative emotions) and cognitive reactance (negative evaluation). Researches based on psychological reactance have found that the higher degree of psychological reactance of users, the worse the AI experience perceived by users [16]. Therefore, the research proposes:

Hypothesis 4: when using AI chatbots, user's emotional reactance has a negative impact on social presence.

Hypothesis 5: when using AI chatbots, user's cognitive reactance has a negative impact on social presence.

E. Social Presence and Trust

Some scholars have studied the relationship between social presence and trust in e-commerce. Zhao Hongxia et al. have proved that social presence is beneficial to dimensions of integrity and kindness of trust [17]. Manning Li's research on virtual health consultation service shows that social presence has a positive impact on users' willingness to reuse [18]. Therefore, the research proposes:

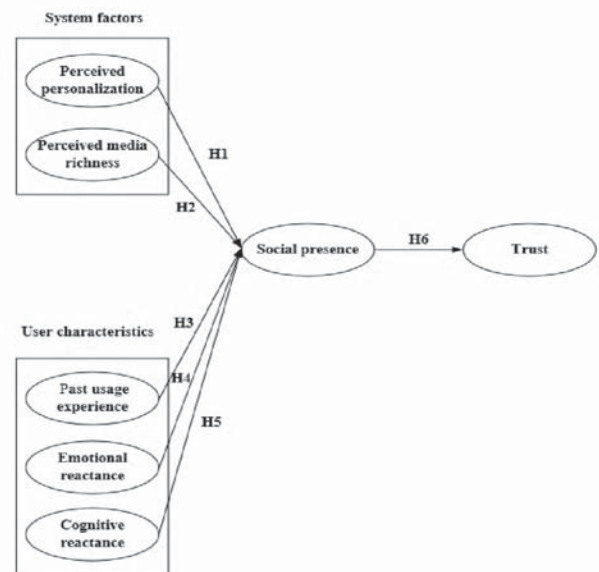Hypothesis 6: when using AI chatbots, social presence has a positive impact on user trust.

Figure 1.   The Research Model on AI Chatbots

IV. METHODOLOGY

A. Measurement

The research published the questionnaire on a Chinese survey platform, wenjuanxing (https://www.wjx.cn/),which is a professional online questionnaire survey platform. There are 31 items in the questionnaire. Measurement items were adapted from previous studies to ensure the content validity of the questionnaire. Specifically, the measures for perceived personalization (three items) came from Hong Zhang et al [9].

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The perceived media richness (four items) was derived from the work by Yiming Zhao [11]. Past usage experience(four items) came from John R [19], emotional reactance(four items) and cognitive reactance(three items) were adapted from the research of Feng W [15], social presence(five items) were derived from Kwan Min Lee et al. [7], trust(four items) were based on work by White Baker [20]. All the other constructs were measured using 7-point Likert scales in which 1 indicated 'strongly disagree' and 7 'strongly agree'.

B. Data Collection

This research collected 442 questionnaires and deleted five questionnaires which answered "no" to the screening questions. In the remaining 437 questionnaires, 60 invalid questionnaires were eliminated. Finally, 377 valid questionnaires were obtained. Among the users who participated in the survey, 65.25% were female, who are more likely to contact with intelligent customer service in the process of shopping, about 90.45% of consumers were young people between 18 and 35 years of age, which is the main group of online shopping.

C. Data Analysis and Results

1) Reliability and Validity

This paper applies confirmatory factor analysis (CFA) to assess the reliability and validity of the research model. The CFA model demonstrates an overall good fit. ($\chi2$=514.180，df=308，$\chi2$/df=1.669，RMSEA=0.042，AGFI=0.886，NFI=0.928，TLI=0.965，CFI=0.970). All the ratios are acceptable. The findings of the CFA confirm that factor loadings are close to or above 0.7 for all measurement items, and Cronbach's alpha scores (α) are all larger than 0.7, indicating the data has an internal consistency. Composite reliability (CR) values are all larger than 0.7, while the value of AVE of all constructs are above 0.5, demonstrating a good convergent validity. Table I shows the result of reliability and convergent validity. As shown in Table II, the square root of AVE of each construct are larger than the correlations between the constructs, indicating the reasonable discriminant validity.

TABLE I   RESULTS OF CONFIRMATORY FACTOR ANALYSIS

Construct	Std	C.R.	Cronbach's α	AVE
Perceived personalization	0.730-0.856	0.850	0.844	0.654
Perceived Media richness	0.649-0.827	0.820	0.820	0.535
Usage experience	0.639-0.834	0.827	0.835	0.547
Emotional reactance	0.776-0.901	0.918	0.917	0.737
Cognitive reactance	0.791-0.864	0.860	0.856	0.671
Social presence	0.798-0.860	0.916	0.916	0.686
Trust	0.731-0.863	0.856	0.855	0.598

TABLE II   RESULTS OF DISCRIMINANT VALIDITY TESTING

Construct	1	2	3	4	5	6	7
PP	0.809						
MR	0.724**	0.731					
UE	0.660**	0.645**	0.739				
ER	-0.259**	-0.264**	-0.386**	0.858			
CR	-0.356**	-0.333**	-0.371**	0.724**	0.819		
SP	0.723**	0.699**	0.699**	-0.266**	-0.370**	0.828	
TR	0.593**	0.533**	0.598**	-0.278**	-0.309**	0.644**	0.773

2) Hypothesis Testing

AMOS 22.0 was conducted to test the hypothesis. The overall hypothesis testing results are presented in Fig. 2. As shown in Fig. 2, perceived personalization has significant, positive effect on social presence (β=0.323, p<0.01), providing support for hypotheses 1. Perceived media richness has significant, positive effect on social presence (β=0.243, p<0.05), providing support for hypotheses 2. Past usage experience has significant, positive effect on social presence (β=0.330, p<0.001), providing support for hypotheses 3. Emotional reactance has significant, positive effect on social presence (β=0.169, p<0.05), which is contrary to the hypothesis 4. Cognitive reactance has significant, negative effect on social presence (β=-0.184, p<0.05), providing support for hypotheses 5. Social presence has significant, positive effect on trust (β=0.750, p<0.001), providing support for hypotheses 6.
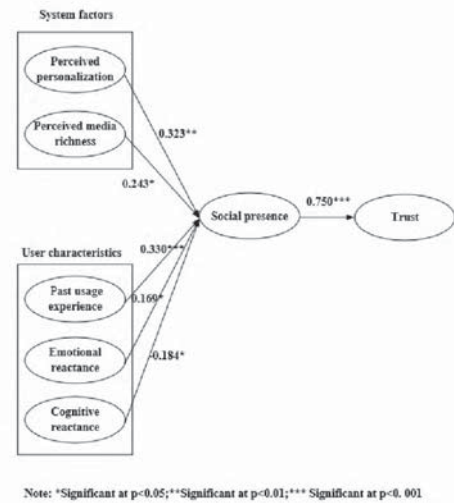

Note: *Significant at p<0.05;**Significant at p<0.01;*** Significant at p<0.001

Figure 2.   Results of Model Testing

V. CONCLUSION

In terms of system perception factors, the results show that perceived personalization and perceived media richness have positive impact on social presence. Regarding personalization, the current intelligent customer service, such as Xiaomi of Taobao, provides "guess what you want to ask" service. The personalization now mainly performs as it can solve the repeated and common consultation problems conveniently and quickly. Regarding perceived media richness, the system of chatbots provides some common media communication forms such as voice, text, map recognition and search function. It is necessary for service providers to pay more attention to the improvement of personalization and ways of media communication in the system design. On the basis of existing technologies, service providers can combine big data analysis to guess users' needs and store users' preferences. Companies can also launch chatbots with different styles (such as serious or lively) according to the user's personal style. With the development and maturity of VR technology, it can be

integrated into the system design of chatbots to enhance the sense of reality in virtual transaction, more emerging technologies can also be considered in order to enrich the media forms.

In terms of user characteristics, the more experienced the users are, the stronger their sense of social presence will be. If users want to gain the benefits of a technology, they must be familiar with the using procedures. Enterprises should encourage new adopters to try the service, while stimulate old ones to continue to use, and by accumulating people to experience it, users can constantly update their self-awareness and obtain better experience in the using process.

Cognitive reactance is negatively correlated with social presence. Regarding emotional reactance has a positive impact on social presence, one plausible explanation for this finding can be seen in the research of Seoummi Young et al [21]. Users who have strong emotional reactance to AI chatbots may pay more attention to the using process, so as to have a stronger sense of presence. Users who maintain cognitive reactance toward AI chatbots do not believe that the chatbots can provide the services they need, so they often refuse to use them. Enterprises can emphasize various functions of the service in marketing, increase user interest in system design, and enhance users' understanding of the system, thereby reduce users' sense of psychological reactance.

Social presence has a positive impact on user trust. When designing the system, enterprises should focus on the user experience and create a humane atmosphere by adding more practical functions and encouraging users to adopt. In this way, the application of AI chatbots can not only create greater benefits for the enterprise, but also can it provide consumers with better service.

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