KEER2022, BARCELONA, SPAIN | SEPTEMBER 6-9 2022
9TH INTERNATIONAL CONFERENCE ON KANSEI ENGINEERING AND EMOTION RESEARCH 2022

KEER2022 | Diversities

EFFECTS OF NONVERBAL COMMUNICATION ON CHATBOT'S PERCEIVED PERSONALITY AND USER SATISFACTION

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ABSTRACT

As artificial intelligence develops rapidly, companies have created exclusive chatbots to facilitate conversational commerce and establish an emotional connection between their brands and their customers. Therefore, shaping the chatbot personality to match the brand image is often the focus of chatbot design. Two studies were conducted to investigate how nonverbal communication elements (avatar, sticker, emoji) affect users' judgment of chatbot personality and explore the effect of chatbot personality on user satisfaction. In Study 1, Kansei engineering was adopted to conduct an online survey using six combinations of nonverbal elements as experimental conditions and the five dimensions of the Brand Personality Scale as Kansei vocabularies. The results revealed that the three nonverbal elements did affect users' perceptions of chatbot personalities; however, the impacts of each element on different personality dimensions varied. In Study 2, based on Study 1, two crowdfunding chatbots with distinct personality traits, sincere and insincere, were developed as the experimental conditions to interact with participants within FB messenger. One hundred fifty valid questionnaires and the click rate of participants during the experiment were collected to measure participants' satisfaction. The results showed that participants were more satisfied with the sincere chatbot than the insincere chatbot. In addition, the personality of the chatbots also affected the participants' judgment of the quality of the messages as well as their willingness to use the chatbots.

Keywords: Chatbot, Nonverbal Communication, Brand Personality, Kansei Engineering, Conversational User Interface

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1   INTRODUCTION

With the rapid growth of artificial intelligence and conversational commerce, chatbots have become necessary for large enterprises. A chatbot is a software application that enables users to verbally interact with companies, services, or brands on the communication software they are familiar with via texts, images, and voices (Nguyen, 2017). Therefore, it is a crucial design strategy for large enterprises to make chatbots with distinct personalities to have social interaction with users through social media platforms, enhance the user experience of e-commerce, and create brand segmentation in conversational commerce (Vlahos, 2019). Studies have investigated the impact of chatbot personality on users (Dibitonto, Leszczynska, Tazzi, & Medaglia, 2018; Thies, Menon, Magapu, Subramony, & O'neill, 2017). However, most of these studies focused primarily on the impact of text-based scripts on chatbot users and rarely considered nonverbal interactions.

Nowak & Biocca (2003) found that making virtual agents more human, such as giving them anthropomorphic appearances or avatars, can significantly facilitate the emotional communication between virtual assistants and users and strengthen brand identity. In addition, Ganster, Eimler, and Kramer (2012) argued that non-verbal cues such as emojis could help people perceive the emotion of the conversation content and feel more immediate and robust about the speaker's personality in computer-mediated communication. Emojis for text conversations are like the speaker's facial expressions, complementing the reader's feeling of not being able to communicate face-to-face with each other.

In addition to emojis, recently, stickers have become very popular among Taiwanese users on communications platforms. For example, according to the official statistics of LINE in Taiwan, users in Taiwan download 18 stickers on average, which is twice the number in Japan (Oung, 2020). Moreover, the usage rate of information models of stickers in each age group is very even (Huan & Xie, 2020), indicating that the Taiwanese generally have accepted expressing their feelings with stickers. Therefore, the study probed into how a chatbot's nonverbal communication contributes to users' perception of the chatbot's personality and further affects user satisfaction. Through two experiments, we intended to discuss the following two questions: (1) whether the nonverbal communication elements (avatar, stickers, emojis) of chatbot influenced people's perception of its personality, and (2) in the conversational commerce, whether the personality of chatbot influenced the satisfaction of e-commerce users.

While it would have been possible to conduct one study to explore the two research questions mentioned above, such a complete factorial design seems unwarranted until the impact of nonverbal communication cues on users' judgments of chatbot personality is clarified first. Then, we can further examine the impact of chatbot personality on user satisfaction. Therefore, two separate experiments were conducted. The following two studies presented here represent investigations into the effect of nonverbal communication on users' judgments of chatbot personality and satisfaction.

2   STUDY 1

Study 1 investigated whether and how chatbot's avatars, emojis, and stickers may affect users' perception of chatbot personality in conversational interactions. Kansei Engineering (KE) was adopted to explore the impacts of the three nonverbal elements on chatbots' perceived personality.

2.1   Kansei Engineering

Consumers' expectations for products or services are often in terms of their feelings and preference, like "luxury, gorgeous, stable," but not specific design features. In order to translate customer perception of the product into design elements, Nagamachi initially proposed the Kansei engineering methodology in the 1970s. The underlying presumption in Kansei engineering is that affective impact on the customer results from the composition of the different product features and properties. Hence, to maximize customer satisfaction, the optimal strategy is to choose the best combination possible. This approach has been successfully used to develop products in a wide range (Nagamachi, 1995; 1999).

Kansei is a Japanese word for people's feelings or perceptions of things. This technique often uses scales and statistical analysis of semantic expressions (Kansei vocabularies) representing different consumers' feelings to explore the relationship between design elements and specific perceptualities. The design elements of a product are called "Items," and the possible options of each item are called "Categories." The main processes include collecting product samples and Kansei vocabularies, selecting representative product samples and representative Kansei vocabularies, deconstructing and sorting product samples to determine the significant items and categories, and establishing the correlation between design elements and Kansei vocabularies (Nagamachi et al., 2008).

The reason to use Kansei Engineering in this research is based on the ability of the method to clarify the effect of each design parameter of a particular product on people's hidden impressions, which can serve as a reference for designers in building chatbots personalities in the future.

2.2   Method

In this primary investigation, we applied the framework of Kansei engineering in an online experiment. We used the avatar, stickers, and emojis as the "Items" and Aaker's (1997) five dimensions of the Brand Personality Scale as the Kansei vocabularies to explore whether and how non-verbal communication design elements in conversational interactions may affect users' perceptions of chatbot personality.

The experiment adopts a 2X2X2 within-subjects design. There are three independent variables (or items in KE): chatbot's avatars, the use of stickers, and the use of emojis (Table 1). For each variable, there were two options (categories in KE). The two avatars used in Study 1 were based on the findings of Huang & Yous' (2019) investigation of the effects of avatar design on chatbot brand personality by Kansei Engineering methodology. For example, avatars with dark hairstyles, smiling eyes, and a grin would give people a feeling of sincerity, competence, and sophistication.

In contrast, avatars with unnatural hair color (e.g., green), a bare forehead, darker-lens glasses, and expressionless faces tended to make people feel the opposite.

Table 1. Independent variables of study 1: nonverbal communication elements of chatbots

Item	Category	
Avatar		
Sticker		No Sticker
Emoji		No Emoji

Table 2. Dependent variables of study 1: 10 questions from the brand personality dimension

Brand Personality Dimension	Kansei vocabularies (Perception of Personality)	
Sincerity	Sincere	Friendly
Excitement	Exciting	Trendy
Competence	Reliable	Intelligent
Sophistication	Feminine	Upper class
Ruggedness	Masculine	Tough

We used the orthogonal design to reduce the number of experimental conditions to six to reduce participant fatigue. Based on the experimental conditions, six animated videos were created to simulate the conversations between chatbots and their users on Facebook messenger using the same dialogue scripts. Participants were then able to view them through an online questionnaire platform. The dependent variables (Kansei vocabularies) were the ten personality traits selected from Aaker's (1997) Brand Personality Scale (Table 2).

The chatbots in the simulation videos served as the recommendation assistant of a movie promotion site in the experiment. All simulation videos use the same dialogue script. Therefore, we only manipulated the non-verbal communication elements of chatbots in the dialogue to generate different experimental conditions. Once the participants were recruited, they were asked to view the videos, then express their impression of each chatbot by filling up an online questionnaire on a five-point Likert scale based on Aaker's (1997) five dimensions of the Brand Personality Scale. Afterward, regression analysis was used to analyze the effects of non-verbal communication elements on chatbots' perceived personalities.
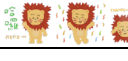
2.3   Results

Two hundred forty-one participants (121 males and 120 females) aged 20-49 were recruited online in Study 1. Through the multiple regression analysis of Hayashi's Quantitative Theory Type 1, the study analyzed the influence of three nonverbal communication elements on five brand

personality dimensions: sincerity, excitement, competence, sophistication, and ruggedness. The analysis results are summarized in Table 3.

As shown in Table 3, the analytical findings are as follows: (1) the use of avatars, stickers, and emojis in chatbots could contribute to participants' perception of the chatbot's personality; however, the effects varied; (2) A chatbot's personality traits were strengthened by adding stickers to convey "sincerity," "excitement," "competence," and "sophistication"; (3) Users perceived chatbots to be more "sincere," "excited," and "competent" when they used emojis; (4) the avatar of chatbots had more influence on users' perception of "sophistication" in chatbots and little on other personalities. Finally, (5) stickers affect users' perception of chatbots' brand personality the most, followed by emojis and avatars.

Table 3. Analytical Results of Hayashi's Quantitative Theory Type 1

Item	Category	Sincerity		Excitement		Competence		Sophistication		Ruggedness	
		Category Score	PCC	Category Score	PCC	Category Score	PCC	Category Score	PCC	Category Score	PCC
Avatar		0.00	0.07	0.01	0.27	0.01	0.31	0.05	0.97	(-0.00)	0.14
		(-0.00)		(-0.01)		(-0.01)		(-0.05)		0.00	
Sticker		0.19	0.99	0.19	0.98	0.06	0.72	0.03	0.87	(-0.02)	0.47
	No Emoji	(-0.10)		(-0.10)		(-0.03)		(-0.01)		0.01	
Emoji	😄😌😊😄	0.03	0.85	0.04	0.81	0.03	0.57	(-0.00)	0.40	(-0.02)	0.52
	No Sticker	(-0.03)		(-0.04)		(-0.03)		0.00		0.02	
Constant		3.53		3.12		3.56		2.78		2.91	
R		0.99*		0.98*		0.80		0.97*		0.66	

PCC: Partial Correlation Coefficient

Furthermore, by using the scores and constants of each nonverbal communication item (and category) in the five personality dimensions in Table 3, the predicted ratings of a chatbot's specific personality trait can be obtained by summing up the "category score" of each item under that personality trait and then adding it to the constant. By doing so, the ratings of the five personality traits for any possible nonverbal combinations in this study can be deduced. In other words, as long as we know which avatar a chatbot uses and whether it uses stickers, emojis, or not, now we can predict how it is perceived by participants in the five brand personality traits.

3 STUDY 2

Study 2 investigated whether chatbot personality affected participants' satisfaction through a between-subject experiment. Based on the result of study 1, we could use avatars, emojis, and stickers to create specific combinations of nonverbal elements for chatbots to elicit certain brand personality traits and further explore the impact of chatbot personality on user satisfaction in e-commerce. The chatbots in the experiment were set as the intelligent assistants on the Facebook

messenger app exclusively for a crowdfunding platform. The experimental scenario was that a chatbot recommended its users merchandise through conversational interaction.

3.1   Method

The independent variable was the chatbot's personality trait elicited by its non-verbal communication. The conversational scripts of both chatbots were identical, and the only difference was their use of nonverbal elements. Therefore, we took the combinations of nonverbal elements with the highest and lowest sincerity personality scores in Study 1 to serve as the cues for chatbot personality (see Table 4). The dependent variables of the experiment were the participants' subjective ratings of satisfaction with chatbots and the number of clicks participants made throughout the conversational interaction. The experiment adopted a between-subject design; each participant only talked to one chatbot. The experimental process was as follows. First, the chatbot introduced itself, followed by a crowdfunding plan recommendation to the participant. Then, according to the participant's answers, provided a link or recommended the next crowdfunding plan until the participant terminated the conversation. Afterward, participants completed a five-point Likert scale questionnaire about their satisfaction with the chatbot.

Table 4. The combination of nonverbal elements for the sincere and insincere chatbots

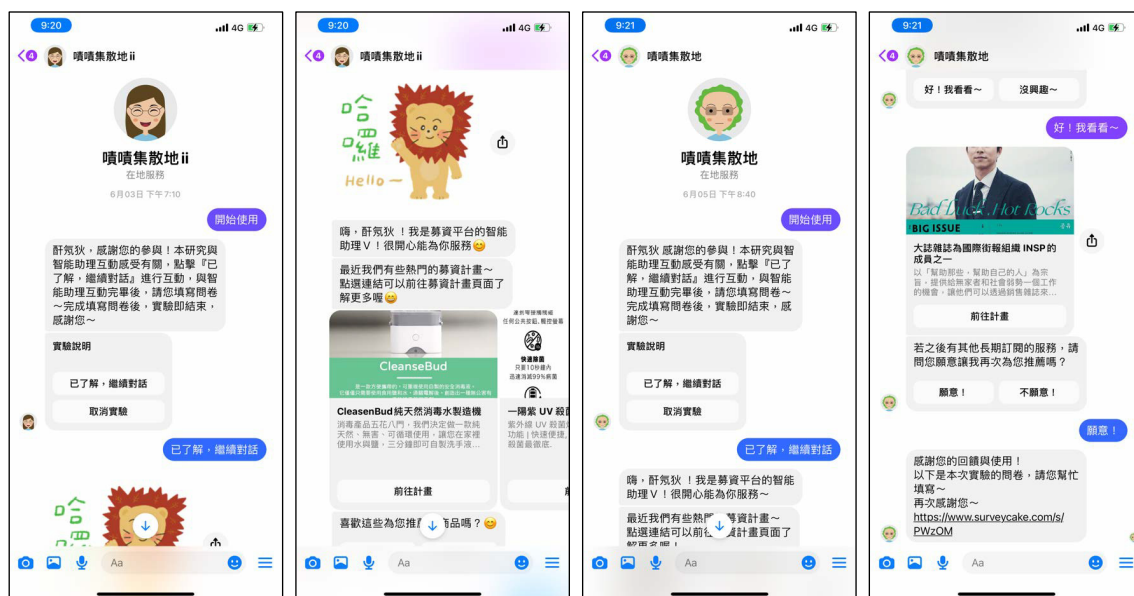| Experimental Condition	Avatar	Sticker	Emoji
Sincere Chatbot			
Insincere Chatbot		No Sticker	No Emoji

Figure 1. Screenshot of dialogues between chatbots and participants in Study 2

270

The two experimental conditions were "sincere chatbot" and "insincere chatbot." The two scripted chatbots were created through the chatbot construction platform Super 8 (Figure 1). The satisfaction measures for Study 2 were based on the chatbot satisfaction scale proposed by Ashfaq, Yun, Yu, & Loureiro (2020) with six constructs, namely Information Quality (5 items), Service Quality (3 items), Perceived Enjoyment (3 items), Perceived Ease of Use (4 items), Satisfaction (2 items), and Continuance Intention (3 items). In addition, the click counts of chatbots' recommendations provided by Super 8 were also collected.

3.2   Results

In Study 2, 150 participants (36 males and 114 females) were recruited. Randomly assigned to two groups, 60 participants interacted with the sincere chatbot, and 90 interacted with the insincere chatbot. The average ratings received in each item of the satisfaction scale for the two chatbots are shown in Table 5. According to Table 5, the sincere chatbot received higher ratings than the insincere chatbot in most satisfaction items except item 7, "the chatbot gives me a prompt response." It indicated that participants' satisfaction with the sincere chatbot was slightly higher than with the insincere chatbot.

Table 5. The comparison of average ratings in the chatbot satisfaction scale

Construct	Items	Sincere chatbot	Insincere chatbot
Information quality	1. The information provided by this chatbot is sufficient.	4.16	3.88
	2. The information provided by this chatbot is clear.	4.21	3.93
	3. The information provided by this chatbot is accurate.	4.05	3.92
	4. The information provided by this chatbot is up to date.	3.96	3.76
	5. The information provided by this chatbot is reliable.	4.03	3.76
Service quality	6. The chatbot has a modern-looking interface.	4.05	3.71
	7. The chatbot gives me a prompt response.	4.25	4.34
	8. The chatbot has visually appealing materials.	3.88	3.52
Perceived enjoyment	9. The conversation with the chatbot is exciting.	3.55	3.26
	10. I enjoy choosing products more if they are recommended by the chatbot than if I choose them myself.	3.35	3.14
	11. I was absorbed in the conversation with the chatbot.	3.70	3.46
Perceived ease of use	12. My interaction with the chatbot is clear and understandable.	4.36	4.13
	13. Interaction with the chatbot does not require a lot of my mental effort.	4.28	4.11
	14. It is easier to use the chatbot to find products that I want to buy.	3.86	3.63
	15. I find the chatbot to be easy to use.	4.23	4.05
Satisfaction	16. I like interacting with the person who provides the service.	4.01	3.84
	17. I feel satisfied about the overall experience of using the chatbot.	3.98	3.85
Continuance intention	18. I intend to continue using this chatbot in the future.	3.66	3.32
	19. I will always try to use this chatbot in my daily life.	3.65	3.37
	20. I will strongly recommend others to use it.	3.53	3.34

Additionally, we used factor analysis and reliability analysis to confirm the factorial structure and reliability of the questionnaire. After removing inappropriate question items, the six constructs in the original satisfaction scale were re-divided into three groups. We renamed the three groups Continuance Intention, Information Quality, and Perceived Ease of Use. The reliability of the scale was then assessed with the three reclassified constructs. The KMO and Bartlett sphere test results indicate that the measure shows acceptable validity and reliability. Then, we applied the one-way analysis of variance (ANOVA) to investigate the effect of chatbot personality on user satisfaction in a merchandise recommended scenario. The results of the ANOVA are presented in Table 6. The results indicate statistically significant differences in the Continuance Intention and Information Quality constructs. Therefore, the chatbot personality prompted by manipulating nonverbal elements indeed affects the participants' satisfaction ratings.

Table 6. Analysis of Variance (ANOVA) results of effects of chatbot personality traits

Tests of Between-Subjects Effects						
Independent Variable	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Chatbot Personality	Continuance Intention	2.230	1	2.230	3.977	0.048*
	Information Quality	1.923	1	1.923	5.563	0.020*
	Perceived Ease of Use	0.538	1	0.538	1.685	0.193

Finally, according to the click count of the chatbot's recommended crowdfunding plan provided by the super 8, the participants' click-through rate (CTR) under different chatbot conditions is compared. The results showed that:

1. The CTR of the five crowdfunding products recommended by the sincere chatbot was 90%, and the CTR of the product recommendations by the insincere chatbot was 55.8%.
2. The CTR of the public welfare projects recommended by the sincere chatbot was 81%, and the CTR of the public welfare projects recommended by the insincere chatbot was 58%.
3. The CTR of accepting further recommendations from the sincere chatbot is 75%, and the CTR of accepting further recommendations from the insincere chatbot is 38%.

To sum up, in the online experiment of crowdfunding plan recommendation with chatbots in the social platform, the participants' click behavior will change slightly due to the chatbot's personality. Moreover, the sincere chatbot can lead to higher click-through rates in referrals for crowdfunding programs.

4   CONCLUSION

The study primarily probed into the influence of nonverbal communication elements on users' perception of chatbot personality and satisfaction in the scenario of merchandise recommended on the crowdfunding platform. Upon the two-stage experiment, the conclusions of the study are as follows:

1. People can perceive different personality traits in chatbots, and the personality traits can be better affirmed with more non-verbal elements. Therefore, chatbot developers could use the non-verbal elements of conversational interaction, such as avatars, emojis, and stickers, to create a chatbot personality that conforms to the corporate image.

2. The chatbot's personality could influence users' satisfaction with a crowdfunding website chatbot. Even though the dialogue scripts for both product recommendation chatbots are identical, merely implying the personality trait of a chatbot through its avatar, stickers, and emojis is enough to affect user satisfaction, causing fluctuations in click behavior.

The presumption in Kansei Engineer holds that the personality traits expressed by a chatbot and its personality perceived by users are not innate characteristics or qualities possessed by the chatbot. Instead, they are users' feelings resulting from the composition of the different design elements in the conversational interaction. The mere change of avatars or use of stickers and emojis could contribute to users' perception of the chatbot's personality and even cause statistically significant differences in user satisfaction. This result indicates that in conversational commerce, besides dialogues, designers can also use nonverbal interaction elements of chatbots to affect users' attitudes towards chatbots and even users' shopping behavior. A substantial portion of communication in our daily life is nonverbal; hence the types of non-verbal communication are wide and varied. However, this preliminary study focused only on avatars, emojis, and stickers. More non-verbal elements could be discussed in-depth on shaping chatbots' personalities for further study. Additionally, different usage scenarios can also be considered to clarify context issues regarding chatbot personalization.

ACKNOWLEDGMENTS

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