Empirical Assessment of User Satisfaction with American and Chinese AI Chatbots

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Abstract: As artificially intelligent chatbots grow in popularity, exploring user satisfaction has become an important topic. This study deviates from the conventional questionnaire approach by adopting a balanced paired design. We employed 40 users to participate in usability testing to assess their satisfaction with the responses of two prominent chatbots (ChatGPT 4.0 from the US and inChat from China) over five domains (daily life, the workplace, advertising copy, current affairs commentary, and translation). We conducted a comparative analysis based on three demographic variables: gender, experience with chatbots, and generation (i.e., age). Empirical results revealed that the participants were more satisfied with inChat's responses overall and for daily life scenarios in particular than with those of ChatGPT 4.0. Further, female participants expressed higher satisfaction with inChat's commentary on current affairs than did male participants. Prior use of chatbots did not significantly influence satisfaction levels; however, Baby Boomers (i.e., those born between 1946 and 1964) showed a notably higher appreciation for inChat's translation capabilities and higher satisfaction overall compared to Generation Y (i.e., those born between 1981 and 1996).

Keywords: Chatbots, ChatGPT 4.0, Inchat, Satisfaction.

1. INTRODUCTION

In his book "The Road Ahead", Bill Gates discussed his perspective on technology and its transformative impact on society, saying, "We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten." The CEO of Advanced Micro Devices (AMD), Su Zifeng, predicted that the most significant technological advancement in the next decade will be artificial intelligence (AI). AI is a technical concept that has made a significant impact across a wide range of industries and domains. It enhances work efficiency and assists in analyzing growing volumes of data to provide viable insights and solutions [1]. Jensen Huang, the CEO of NVIDIA, noted that the AI market is currently experiencing what he termed the "iPhone moment", as various innovative technologies usher the world into an era of smart living. Numerous companies have launched generative AI services, such as Amazon's AWS HealthScribe, Apple's Apple GPT, and Google's Bard. ChatGPT (Chat Generative Pre-trained Transformer), developed by OpenAI in November 2022, has become particularly notable, attracting over a hundred million users within just two months of its launch; it is currently valued at 29 billion USD. The technological breakthrough represented by this service may replace search engines in the future, although certain issues remain to be addressed. China was relatively behind in this field; however, the State Council of China released a strategic blueprint in 2017 with the goal of achieving a leading position in AI by 2030 [2]. Subsequently, Chinese tech giant Baidu launched the AI program "Wenxin Yuyan".

The application range of chatbots continues to widen, encompassing domains such as customer services for online shopping [3], medical consultation [4], and education [5]. While these innovative applications have contributed to enhancing work efficiency [6], they pose challenges regarding user acceptance and satisfaction and even cultural disparities in usage across different regions [7] [8]. Existing studies on user satisfaction with chatbots have identified several factors of customer satisfaction. [9] and [10] agree that service recovery, conversation quality, and information and service quality are crucial. [11] highlighted the importance of usability, entertainment value, and social interaction. [12] emphasized the significance of system design, customer technical ability, and brand trust. [13] and [14] pointed out that human-like qualities, customer engagement, and trust contribute to

satisfaction. Uniquely, [15] explored how cultural differences between China and Hong Kong affect user preferences.

Researchers have yet to examine how user satisfaction varies with chatbots developed in different regions. The current study aimed to fill this gap by exploring the satisfaction of users in Taiwan with chatbots from the United States (US) and China. Under a balanced paired design, we invited 40 participants to evaluate the responses produced by ChatGPT 4.0 from the US and inChat from China for five domains: daily life, the workplace, advertising copy, current affairs commentary, and translation. We divided the participants according to gender, experience with chatbots, and age for comparative analysis. We found that for daily life responses, users exhibited a notable preference for inChat over ChatGPT 4.0 as well as a significantly higher overall satisfaction with inChat. In terms of gender differences, female participants were more satisfied with inChat's current affairs commentary than were male participants. Interestingly, experience using chatbots did not affect satisfaction levels; however, Baby Boomers accorded higher ratings to inChat's translation capabilities and overall performance than did Generation Y.

This study makes valuable contributions to both theory and practice. Given the current scarcity of research on user satisfaction with American and Chinese chatbots in Taiwan, our findings bridge an important research gap. We also underline the notable advantage of inChat regarding daily life responses and recommend developers incorporate local regional linguistic features in future versions of ChatGPT to optimize language generation.

The remainder of this study is structured as follows. In the next section, we review relevant literature, exploring the development trajectory of chatbots, the selected American and Chinese chatbots, the multi-disciplinary application of chatbots, and user satisfaction with chatbots. The third section outlines our research methodology, including research subjects, item design, experimental procedures, and data analysis. The fourth section presents our empirical results, including descriptive statistics and a discussion of how the results differed with chatbots, gender, experience with chatbots, and age. The fifth section concludes the study and provides recommendations.

2. LITERATURE REVIEW

2.1. Development Trajectory of Chatbots

In 1950, Alan Turing introduced an assessment criterion known as the "Turing Test" to explore the question "Can machines think?" [16]. In 1966, Weizenbaum from Massachusetts Institute of Technology developed what is considered the first-generation chatbot ELIZA, which simulated psychotherapist-patient dialogues through pattern-matching techniques [17]. Following this, Kenneth Mark Colby from Stanford University proposed Parry in 1972; this chatbot simulates interactions with a paranoid schizophrenic individual, sparking responses and discussions [18].

In 1988, Rollo Carpenter created Jabberwacky to generate appropriate responses by retaining all dialogues and matching patterns within the context [19]. In 1994, Michael Mauldin coined the term "Chatterbot" to describe systems simulating human interactions [20]. In 1995, Richard Wallace created A.L.I.C.E., scripted with his own XML markup language Artificial Intelligence Markup Language (AIML), which laid the groundwork for all ensuing chatbots [21].

The development of chatbots accelerated in the 21st century. In 2002, [22] introduced the chess system Deep Blue, showcasing the potential of AI in complex decision-making tasks and paving the way for AI applications in broader domains. In 2006, Hinton introduced the Restricted Boltzmann Machine (RBM) model and Deep Belief Networks (DBN), formally naming multi-layer neural networks as deep learning [23]. Between 2010 and 2019, several mainstream personal assistants and chatbots were launched. For instance, Siri was introduced by Apple in 2010 , IBM Watson was launched by IBM in 2011 , Google Assistant was brought in by Google in 2012 , and Microsoft Cortana and Amazon Alexa were launched in 2014 by Microsoft and Amazon respectively. Each service offered distinct features, albeit with certain technical and security limitations. In 2017, AlphaZero demonstrated the ability to surpass all other game-specific programs in self-play through reinforcement learning algorithms [24].

In November 2022, the free chatbot ChatGPT, a natural language generative model developed by OpenAI in San Francisco, was released. Within just two months of its launch, the user count exceeded one hundred million. It was considered a significant technological breakthrough in the industry, and such robust growth has profound implications and prospects both in theory and in practice.

2.2. Multidisciplinary Application of Chatbots

With the rapid evolution of technology, the applications of chatbots have transcended a single domain. From information retrieval to enhancing work efficiency, their ability to perform complex tasks has granted them roles in fields such as education and healthcare. Such versatility has garnered widespread recognition across sectors. The financial and business realms have long recognized the immense potential of chatbots. For example, many international banks have applied them to improve the quality of customer service.

This widening range of applications has prompted a plethora of research. For example, [25] explored the application of chatbots to business processes, proposing new directions for research. [26] highlighted the room for improvement necessary to employ this technology in Arab countries, as the complexity of the Arabic language continues to limit its development. [27] explored how enterprises employ chatbots during product development to collect and evaluate customer opinions. [28] delved further into how brands, when employing chatbots, can leverage emoticons to influence consumer perceptions towards the brand.

In the domain of second-language learning, [29] explored how integrating elements of culture, empathy, and humor during the teaching process can enhance students' learning experiences. Concurrently, [30] identified the advantages of chatbots for language learning. [31] concluded that in the healthcare sector, multilingual chatbots can provide effective interactive services, especially during patient recovery phases. In the transport sector, [32] examined the use of chatbots for training and assisting operators in inspecting containers at seaports, demonstrating unique functionalities in this scenario. [33] discussed the significance of AI and 3D technology in strategies for the energy sector. Chatbots have also been combined with intelligent data collection technologies to monitor outdoor recreational activities [34].

The emergence of ChatGPT has opened a new chapter in AI, reigniting global attention. According to an in-depth analysis in a report by the "Finance Information" Taiwan Finance Magazine, ChatGPT, with its outstanding answering capabilities, has not only altered user perceptions of chatbots but also demonstrated the depth of AI's comprehension and response abilities. However, the report mentioned that ChatGPT still cannot answer 'unasked questions'. That is, although ChatGPT possesses powerful answering capabilities, it falls short on innovative questions. We thus compiled a series of questions from various media reports and conducted in-depth practical investigations to further explore the potential and value of chatbots in different fields.

2.3. User Satisfaction with Chatbots

Chatbots have been integrated across multiple domains, including customer service, banking, education, and retail. These automated conversational agents enhance service efficiency and reduce costs. However, whether these benefits translate into user satisfaction and influence continued intention to use are issues worth exploring further.

[9] explored performance evaluations of chatbots and found high levels of satisfaction in customer service. Service recovery and conversation quality were the main factors of overall customer satisfaction. A study by [11] found that the perceived usefulness, entertainment value, technological appeal, and social interaction derived from chatbots positively impacted user satisfaction; they also found that information quality and service quality were pivotal. When the information provided by the chatbot is accurate, useful, and easy to comprehend, user satisfaction tends to improve. Additionally, if the chatbot responds quickly, interacts smoothly, and effectively handles user queries, its service quality is deemed high, thereby augmenting user satisfaction [10]. Further research by [7] utilized structural equation modeling (SEM) for in-depth analysis and uncovered that rapid responses and adaptable conversation tones are key to interaction quality in conversations with chatbots.

Moreover, the perceived usefulness of chatbots plays an indispensable role in overall satisfaction. [12] identified three major factors of user satisfaction: overall system design, technical usability, and customer trust in the brand. In the domain of food e-commerce, [13] revealed that chatbots with human-like characteristics significantly elevated user satisfaction, which was also influenced by enjoyment, positive attitudes, and brand trust. Incorporating human-like elements into chatbot design seems to be an important direction for future development.

[14] discovered through a systematic review of 83 publications on chatbots over the past decade that the services offered by chatbots are well-suited to functionally-robust products or services. He further identified that the three major concerns of customers regarding chatbots are satisfaction, engagement, and trust. [35] considered the human-computer interaction (HCI) to propose a series of open questions for future research. Applying these, [36] found that customers generally felt that chatbots lacked sincerity and fluidity in service recovery. Adjusting people's expectations regarding chatbots' emotional presentations may enhance customer satisfaction in this regard. Many leading brands and government institutions employ chatbots for consumer interactions, and major issues include chatbots misunderstanding queries, providing irrelevant responses, and poor integration with human service representatives [37].

In terms of regional cultural differences, [15] delved into the satisfaction and usage intention of chatbot users in Mainland China and Hong Kong. Their study revealed that information relevance, completeness, enjoyment during use, and assurance are key factors of user satisfaction and continued use intention. Furthermore, it was found that regional characteristics affect user preferences: users from Mainland China particularly valued response time and empathy, while users from Hong Kong were more concerned about privacy protection. Further analysis found that the perceived usefulness and ease of use of chatbots, along with trust in the technology, positively affected user attitudes. Trust not only enhances users' perception of chatbot usefulness but also significantly improves satisfaction and usage attitudes [38].

Overall, current literature on chatbot user satisfaction indicates that customer service, information quality, service quality, interactive experience, the overall system design, user technical proficiency, and brand trust significantly impact user satisfaction. Notably, incorporating humanistic elements and enhancing user enjoyment can contribute to improved user satisfaction towards chatbots. In emotional contexts such as service recovery, the sincerity and efficacy of chatbots could be further optimized. In addition, regional and cultural characteristics should be considered in chatbot development. The current study thus explored the satisfaction of users in Taiwan with ChatGPT 4.0 from the US and inChat from China.

2.4. INTRODUCTION TO SELECTED AMERICAN AND CHINESE CHATBOTS

The chatbots selected for this study were ChatGPT 4.0 developed by OpenAI in the US and inChat from China. Built on AI technologies developed by Baidu, inChat encompasses areas such as voice recognition, natural language processing, and image recognition [39]. Although Baidu has also launched its ERNIE Bot for general users, it currently only supports Baidu accounts and requires linkage to Mainland China phone numbers for both enterprises and individual users. Therefore, this study considered the Chinese inChat, which can be accessed online in Taiwan.

2.5. Chatgpt 4.0

ChatGPT 4.0 is a chatbot developed by the American company OpenAI. OpenAI is a non-profit artificial intelligence research organization established in 2015, located in San Francisco, US. The organization was co-founded by several notable individuals, including Elon Musk and Sam Altman. OpenAI released ChatGPT on November 30, 2022, which belongs to the 'text generation' AI series. Having been trained on a vast array of text samples obtained from the internet, this product is proficient in many disciplines and can answer a myriad of questions in natural language using deep learning. ChatGPT 4.0 utilizes natural language processing technology to achieve high levels of automated conversation. By leveraging AI and machine learning, it can generate dialogues that closely resemble human interaction, enhancing the accuracy and speed of interactions. This makes ChatGPT 4.0 a valuable AI tool for service-oriented industries [40].

Indeed, the application scenarios for ChatGPT 4.0 continue to diversify. It can engage in conversations naturally, making interactions as smooth as conversing with a real partner. It is also capable of generating high-quality articles, stories, and poetry and can answer questions across various domains ranging from history to science and culture to technology. In daily use, ChatGPT 4.0 not only provides writing suggestions but also offers code examples and troubleshooting tips to programmers, saving significant time and resources [41]. It also plays a crucial role in the education sector by providing valuable learning resources for students, assisting them in resolving queries, explaining complex concepts, and promoting the dissemination of knowledge.

Many major global tech companies and research institutions are actively seeking integration with ChatGPT, thus ushering in a new era of AI application. The core technologies of ChatGPT, including large-scale language models, contextual learning, and human feedback-driven reinforcement learning, are attracting an increasing number of enterprises and research institutions to develop products related to OpenAI's ChatGPT. For instance, Microsoft has integrated ChatGPT with its search engine Bing, Baidu has launched a similar product called Wenxin Yanyan (i.e., ERNIE Bot), and Sensetime has developed the SenseChat robot capable of generating graphics, videos, and 3D content.

2.6. Inchat

inChat was launched in January 2023 by Chengdu BeiYin Technology Co., Ltd. in China. It allows users to interact in a question-and-answer (Q&A) format as well as chat and share content. This initiative aims to leverage innovative AI technology to advance technological progress. The core technology of inChat is the software development toolkit (SDK) provided by Baidu, a third-party core technology partner of Chengdu BeiYin Technology. The collaboration is officially titled "Baidu Brain AI Development Platform" . Its upgrade to version 5.0 in 2019 signified a significant breakthrough in computational architecture for the mass production of integrated AI. Hence, the collaboration between Chengdu BeiYin Technology and Baidu further actualized the core functionalities of AI applications and enhanced user experience.

Baidu's SDK equips inChat with advanced voice recognition and image processing technologies, enabling the chatbot to better understand user needs and provide more accurate responses. This showcases Baidu's leading-edge capabilities in language processing and machine learning as well as demonstrates the practical application value of chatbots for various industries.

3. RESEARCH METHODOLOGY

3.1. Research Subjects

This study investigated user satisfaction with the responses provided by American and Chinese AI chatbots. As we sought to compare the potential effects of gender, experience with chatbots, and age, it was essential to ensure that the sample size under each condition was equal to render statistical analysis effective. We therefore drew on the work of [42] in our adoption of a balanced design for the selection of experimental participants. Thus, our final sample comprised 20 individuals of each gender. We also classified the age groupings based on the suggestions of [43] and divided the sample into four groups of 10 individuals each: Baby Boomers (born between 1946 and 1964), Generation X (born between 1965 and 1980), Generation Y (born between 1981 and 1996), and Generation Z (born between 1997 and 2009).

3.2. Item Design

We designed five question items to generate chatbot responses and one item to evaluate overall satisfaction. The first question ("How to fix a clogged toilet") was designed to assess the capability of chatbots to provide practical, accurate, and organized solutions for everyday problems. The second question, on the impact of AI on professions, was designed to gauge the respondents' views on the changes brought by AI and evaluate the chatbots' performance in explaining complex technological topics. McKinsey (2023) suggested that many jobs involving communication, supervision, documentation, and interpersonal interaction might be automated by

generative AI. The third question prompted chatbots to create advertising copy for the product "Radiant Eye Soother Hot and Cold Eye Massager", a popular massaging appliance from the PChome 24h shopping website. For e-commerce platforms, an enticing product description is crucial as it directly influences consumers' purchase decisions. A good advertisement should be appealing, creative, and able to highlight the features of the product. Through this question, we sought to assess the creative writing abilities of the chatbots. The fourth question addressed one of Taiwan's current transportation issues: "How can Taiwan alleviate its 'pedestrian hell'?" With this topic, we sought to explore the competency of the chatbots in analyzing and solving localized social issues. The fifth question referenced a quote by Warren Buffett to challenge the chatbots' capacity and accuracy in translation. Successful translation requires understanding not only linguistic implications but also the cultural context and scenario. These five questions formed a comprehensive and diversified questionnaire. After interacting with both chatbots, respondents were asked to provide an overall satisfaction rating. The experimental test items are shown in Table 1.
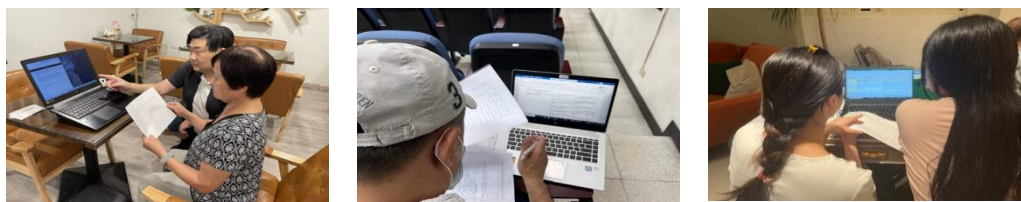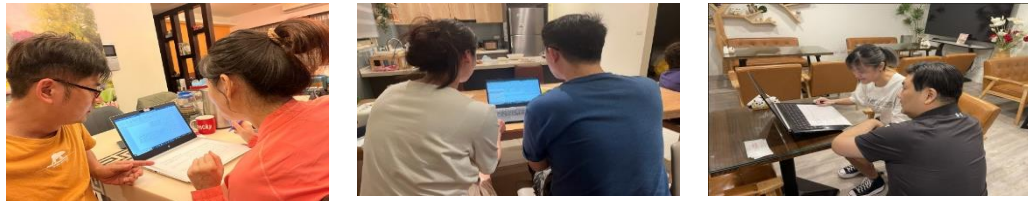
Table 1: Experimental test items

Item umber	Item content
Item 1	Everyday life: "How to fix a clogged toilet" – please provide a structured, step-by-step solution in 200 words or less. • Reference Source: NOWnews Today's News. (December 6, 2022). Incredible ChatGPT Chatbot! Assists with essay writing and toilet repair: Also understands Chinese.https://www.nownews.com/news/5992960
Item 2	The workplace: "Which professions will AI impact directly?" – please write a response in 300 words or less. • Reference Source: CnYES News Center. (June 16, 2023). McKinsey Report: Which industries are most impacted by AI? https://news.cnyes.com/news/id/5217532.
Item 3	Advertising copy: "RevitalEye Soothing Hot and Cold Eye Massager" – please write advertising copy for this product in 200 words or less. • Reference Source: PChome 24h Shopping Website. tokuyo RevitalEye Soothing Hot and Cold Eye Massager TS-188. https://24h.pchome.com.tw/.
Item 4	Current affairs commentary: "Taiwan has been dubbed a 'pedestrian hell' by international media, drawing attention to the issue of vehicles yielding to pedestrians." – please explain how this problem can be improved in 200 words or less. • Reference Source: The News Lens. (May 20, 2023). "How to Rescue Taiwan's 'Pedestrian Hell'? Follow the U.S. to Fully Implement 'Stop Before Going' and 'Complete Pedestrian Right-of-Way'.https://www.thenewslens.com/article/185794.
Item 5	Translation: Warren Buffett said, "What's nice about investing is you don't have to swing at every pitch. The trick in investing is just to sit there and watch pitch after pitch go by and wait for the one right in your sweet spot." – please translate into Chinese. • Reference Source: Daily Headlines. (May 7, 2019). A Collection of 'Stock God' Warren Buffett's Quotes (Chinese-English Comparison). https://kknews.cc/finance/jkk6yp6.html.
Item 6	Please provide an overall satisfaction rating for these two chatbot services.

3.3. Experimental Procedure

We employed usability testing for the in situ experiment, a method developed by [44] [45] within the domains of HCI and user experience (UX). Observing real users interact with a product or system in an experimental setting allows for a thorough and accurate assessment of its performance and user satisfaction levels. We first asked participants to interact with ChatGPT 4.0 and inChat by inputting the predetermined questions. To ensure authenticity, the participants were asked to immediately mark their level of satisfaction with the response after each item on a 7-point Likert scale, where '1' signifies 'strongly disagree' and '7' signifies 'strongly agree'. Finally, participants are asked to provide an overall satisfaction rating for each of the two chatbots. These experimental steps are illustrated in Figure 1.

Step - 1: Input pre-determined questions 1 through 5 into both ChatGPT 4.0 and inChat.

Step - 2: Read responses.

Step - 3: Rate your level of satisfaction with the responses.

Item number	ChatGPT 4.0	inChat
Item 1 Everyday life	7-point Likert scale	7-point Likert scale
Item 2 The workplace	7-point Likert scale	7-point Likert scale
Item 3 Advertising copy	7-point Likert scale	7-point Likert scale
Item 4 Current affairs commentary	7-point Likert scale	7-point Likert scale
Item 5 Translation	7-point Likert scale	7-point Likert scale
Item 6 Overall satisfaction	7-point Likert scale	7-point Likert scale

Note: The 7-point Likert scale is as follows: ☐ 1. very dissatisfied, ☐ 2. dissatisfied, ☐ 3. slightly dissatisfied, ☐ 4. neutral, ☐ 5. slightly satisfied, ☐ 6. satisfied, ☐ 7. very satisfied.

Figure 1: Procedure of usability field experiment

3.4. DATA ANALYSIS

We analyzed the collected data using SPSS 22.0. We first compiled descriptive statistics for the demographic characteristics of the participants. Paired sample t-tests were then employed to detect differences in satisfaction levels between the American and Chinese chatbots for the six items. Independent sample t-tests were used to ascertain differences in satisfaction levels between genders and between those with and without experience with chatbots. Finally, one-way ANOVA was applied to determine if there were discernible differences in satisfaction levels across different generations.

For each analysis, we adopted a two-tailed test, with ***, **, and * denoting statistical significance at the 1%, 5%, and 10% levels, respectively. We referred to [46] for computation, presenting the effect size of mean differences to assess if statistically significant differences had substantive importance.

4. ANALYSIS OF EXPERIMENTAL RESULTS

4.1. Descriptive Statistics

This study primarily referenced the foundational concepts of experimental design proposed by [42], utilizing a balanced design to evenly distribute participant gender and age. We grouped the ages of participants using the definitions by [43], as follows: Baby Boomers (born between 1946-1964), Generation X (born between 1965-1980), Millennials or Generation Y (born between 1981-1996), and Generation Z (born between 1997-2009).

Table 2 displays descriptive statistics. Of the 40 participants, gender was equally distributed, and each generational cohort was represented by 10 participants. In this sample, 57.5% of the participants indicated they had never used a chatbot before, and 42.5% had prior experience with chatbots.

Table 2: Descriptive statistics

Participant characteristics	Classification	Frequency	(%)
Gender	Male	20	50.0%
	Females	20	50.0%
Generation	Baby Boomers（1946 - 1964）	10	25.0%
	Generation X（1965 - 1980）	10	25.0%
	Generation Y（1981 - 1996 ）	10	25.0%
	Generation Z（1997 - 2009）	10	25.0%
Do you have experience with Chatbots?	No	23	57.5%

4.2. Comparison of User Satisfaction with American and Chinese Ai Chatbots

4.2.1. Dependent Sample T-Tests for User Satisfaction with Chatbots

In the comparative analysis of the mean differences, dependent sample t-tests were conducted to assess satisfaction levels with responses to the six items. The results are presented in Table 3. For Item 1 (Everyday life), test statistic t (39) = -2.560 with a p-value of 0.014, significant at the 5% level and indicating a negative direction, with a medium effect size of -0.638. This suggests that participants found the responses from inChat more useful than those from ChatGPT 4.0. Similarly, there was a significant difference in overall satisfaction (Item 6), with test statistic t (39) = -2.318 and p = 0.026, also significant at the 5% level in the negative direction, with a medium effect size of -0.565, indicating higher overall satisfaction with inChat compared to ChatGPT 4.0.

Analysis through dependent sample t-tests clearly indicates that participants were more satisfied with the responses from the Chinese inChat in terms of everyday life topics and overall satisfaction compared to the American ChatGPT 4.0. Particularly in the context of everyday life questions, participants found the answers provided by inChat to be more practical; in terms of overall satisfaction, participants also expressed a higher degree of satisfaction with the responses from inChat.

Table 3: Paired-sample *t*-tests of user satisfaction with American and Chinese chatbots

Item number	Mean value (standard deviation)		Mean difference (standard deviation)	*df*	*t* value	*p* value	Effect size (d)
	American ChatGPT 4.0	Chinese inChat					
1 Everyday life	4.775 (1.311)	5.575 (1.196)	-0.800** (1.977)	39	2.560	0.014	-0.638
2 The workplace	5.150 (1.210)	5.000 (1.281)	0.150 (1.955)	39	0.485	0.630	0.120
3 Advertising copy	4.900 (1.411)	5.500 (1.378)	-0.600 (2.262)	39	1.677	0.101	-0.430
4 Current affairs commentary	5.225 (1.250)	5.200 (1.488)	0.250 (2.154)	39	0.73	0.942	0.018
5 Translation	4.900 (1.215)	5.250 (1.428)	-0.350 (2.155)	39	1.027	0.311	-0.261
6 Overall satisfaction	5.000 (1.240)	5.625 (0.952)	-0.625** (1.705)	39	2.318	0.026	-0.565

Note: The mean difference was calculated by subtracting the mean score of ChatGPT 4.0 from that of inChat. ***, **, and * respectively indicate statistical significance at the 1%, 5%, and 10% levels. The effect size (d) is Cohen's d value, with ≥ ±0.2 representing a small effect, ≥ ±0.5 a medium effect, and ≥ ±0.8 a large effect.

4.2.2. Independent Sample T-Tests of User Satisfaction by Gender

Table 4 presents the independent sample t-test results for satisfaction with six items by gender. The test results indicate that for all items on ChatGPT 4.0, there was no statistically significant difference in satisfaction levels between male and female participants. However, for inChat, on Item 4 (Current affairs commentary), the test statistic was t (38) = -1.744 with a p-value of 0.089, significant at the 10% level in the negative direction, with a medium effect size of -0.552. This shows that females expressed significantly higher satisfaction with the response to this question compared to males.

Table 4: Independent sample *t*-test of user satisfaction by gender

ChatBOT	Item number	Mean value (standard deviation)		Mean difference (standard deviation)	df	t value	p value	Effect size (d)
		Male (N = 20)	Females (N = 20)					
ChatGPT 4.0	Item 1 Everyday life	4.500 (1.357)	5.050 (1.234)	-0.550 (0.410)	38	1.341	0.188	-0.424
	Item 2 The workplace	5.300 (1.081)	5.000 (1.338)	0.440 (0.264)	38	0.780	0.440	0.247
	Item 3 Advertising copy	5.050 (1.468)	4.750 (1.372)	0.508 (0.300)	38	0.668	0.508	0.211
	Item 4 Current affairs commentary	5.500 (1.146)	4.900 (1.293)	0.650 (0.386)	38	1.682	0.101	0.491
	Item 5 Translation	5.050 (1.146)	4.750 (1.410)	0.300 (0.386)	38	0.777	0.442	0.233
	Item 6 Overall satisfaction	5.100 (1.165)	4.900 (1.334)	0.200 (0.396)	38	0.392	0.697	0.160
inChat	Item 1 Everyday life	5.650 (1.040)	5.500 (1.357)	0.150 (0.382)	38	0.392	0.697	0.124
	Item 2 The workplace	4.950 (1.276)	5.050 (1.317)	-0.100 (0.410)	38	0.244	0.809	-0.077
	Item 3 Advertising copy	5.500 (1.539)	5.500 (1.235)	0.000 (0.441)	38	0.000	1.000	0.000
	Item 4 Current affairs commentary	4.800 (1.436)	5.600 (1.465)	-0.800* (0.459)	38	1.744	0.089	-0.552
	Item 5 Translation	4.950 (1.432)	5.550 (1.395)	-0.600 (0.447)	38	1.343	0.187	-0.424
	Item 6 Overall satisfaction	5.500 (1.051)	5.750 (0.851)	-0.250 (0.302)	38	0.827	0.414	-0.261

Note: The mean difference was calculated by subtracting the average score of females from that of males. ***, **, and * respectively indicate statistical significance levels of 1%, 5%, and 10%.

4.3. Independent Sample T-Tests of User Satisfaction by Prior Experience

Table 5 illustrates the independent sample t-test results for satisfaction with six items by experience with chatbots. The test results show that there was no statistically significant difference in the satisfaction levels for those with and without experience with chatbots. In other words, the participants' satisfaction with the responses from both chatbots was similar, irrespective of their previous experience with such technologies.

Table 5: Independent sample *t*-test of user satisfaction by experience with chatbots

ChatBOT	Item number	Mean value (standard deviation)		Mean difference (standard deviation)	df	t value	p value	Effect size (d)
		No (N = 23)	Yes (N = 17)					
ChatGPT 4.0	Item 1 Everyday life	4.913 (1.474)	4.588 (1.064)	-0.325 (0.421)	38	0.771	0.446	0.253
	Item 2 The workplace	5.000 (1.348)	5.353 (0.996)	0.353 (0.388)	38	0.910	0.369	-0.298
	Item 3 Advertising copy	4.652 (1.641)	5.235 (0.970)	0.583 (0.415)	36.505	1.404	0.169	-0.433
	Item 4 Current affairs commentary	5.087 (1.379)	5.412 (1.064)	0.325 (0.402)	38	0.809	0.424	-0.264
	Item 5 Translation	4.696 (1.185)	5.176 (1.237)	0.481 (0.386)	38	1.246	0.221	-0.396
	Item 6 Overall satisfaction	4.783 (1.347)	5.294 (1.047)	0.512 (0.393)	38	1.301	0.201	-0.242

inChat	Item 1 Everyday life	5.565 (1.343)	5.588 (1.004)	0.230 (0.388)	38	0.879	0.385	-0.019
	Item 2 The workplace	5.174 (1.234)	4.765 (1.348)	0.324 (-0.410)	38	0.999	0.324	0.317
	Item 3 Advertising copy	5.739 (1.453)	5.176 (1.237)	-0.563 (0.437)	38	1.288	0.206	0.417
	Item 4 Current affairs commentary	5.130 (1.714)	5.294 (1.160)	0.164 (0.455)	37.772	0.360	0.721	-0.112
	Item 5 Translation	5.435 (1.441)	5.000 (1.414)	-0.435 (0.457)	38	0.951	0.348	0.305
	Item 6 Overall satisfaction	5.739 (0.915)	5.471 (1.007)	-0.269 (0.306)	38	0.879	0.385	0.279

Note: The definition of 'experience with chatbots' refers to whether participants had used chatbots before this experimental test; a response of 'no' indicates that this was their first encounter with a chatbot. The mean difference was calculated by subtracting the mean score of responses from participants who had not used chatbots before from those who had. ***, **, and * respectively signify statistical significance levels at 1%, 5%, and 10%.

4.4. Anova Test for Differences in User Satisfaction by Generation

To examine whether there were differences in satisfaction with the six items by age, this study employed a one-way independent sample ANOVA test and utilized Scheffe's method for post-hoc comparisons. For simplicity, we address only those results which reached statistical significance (see Tables 6 and 7). The test results revealed that Baby Boomers were significantly more satisfied (5% level) with inChat's response to Item 5 (translation) than were Generation Y. Similarly, the overall satisfaction of Baby Boomers with inChat was also significantly higher (10% level) than that of Generation Y. This suggests that users from different generations may have varying expectations and satisfaction levels regarding chatbot interactions, reflecting differences in technology acceptance and usage experience across generations.

Table 6: ANOVA test of user satisfaction with inChat Item 5 by generation

Chatbot	Item number	(I) Generation	(J) Generation	Mean difference (I - J)	Standard error	*p* value
inChat	Item 5 Translation	Baby Boomers	Generation X	0.300	0.570	0.964
			Generation Y	1.900**	0.570	0.020
			Generation Z	0.800	0.570	0.585
		Generation X	Baby Boomers	-3.000	0.570	0.964
			Generation Y	1.600	0.570	0.066
			Generation Z	0.500	0.570	0.857
		Generation Y	Baby Boomers	-1.900**	0.570	0.020
			Generation X	-1.600	0.570	0.066
			Generation Z	-1.100	0.570	0.310
		Generation Z	Baby Boomers	-0.800	0.570	0.585
			Generation X	-0.500	0.570	0.857
			Generation Y	1.100	0.570	0.310

Note: Baby Boomers: born 1946-1964; Generation X: born 1965-1980; Generation Y: born 1981-1996; and Generation Z: born 1997-2009. ***, **, and * indicate statistical significance levels at 1%, 5%, and 10%, respectively.

Table 7: ANOVA test of user satisfaction with inChat Item 6 by generation

Chatbot	Item number	(I) Generation	(J) Generation	Mean difference (I - J)	Standard error	*p* value
inChat	6 - Overall satisfaction	Baby Boomers	Generation X	0.200	0.396	0.968
			Generation Y	1.100*	0.396	0.070
			Generation Z	0.600	0.396	0.522
		Generation X	Baby Boomers	-0.200	0.396	0.968
			Generation Y	0.900	0.396	0.181
			Generation Z	0.400	0.396	0.797
		Generation Y	Baby Boomers	-1.100*	0.396	0.070
			Generation X	-0.900	0.396	0.181
			Generation Z	-0.500	0.396	0.665

		Generation Z	Baby Boomers	-0.600	0.396	0.522
			Generation X	-0.400	0.396	0.797
			Generation Y	0.500	0.396	0.665

Note: Baby Boomers: born 1946-1964; Generation X: born 1965-1980; Generation Y: born 1981-1996; and Generation Z: born 1997-2009. ***, **, and * indicate statistical significance levels at 1%, 5%, and 10%, respectively.

CONCLUSIONS AND RECOMMENDATIONS

This study evaluated the satisfaction of users in Taiwan with two major chatbots: ChatGPT 4.0, which is from the US, and inChat, which is powered by Baidu AI from China. Employing a balanced paired design and usability testing methods, 40 participants were invited to conduct live experiments to assess their satisfaction with chatbot responses in five domains – everyday life, the workplace, advertising copy, current affairs commentary, and translation – and overall satisfaction. The findings indicate that inChat demonstrated a significant advantage with responses to everyday life queries and overall satisfaction. This could be attributed to inChat's linguistic development in China, allowing it to better address and solve the practical issues of users in Taiwan. Regarding gender differences, females exhibited notably higher satisfaction with inChat's responses to current affairs commentary than did males, suggesting potential gender-based disparities in the evaluation of chatbots. Concerning generational differences, the Baby Boomer generation rated inChat's translation capabilities and overall satisfaction higher than did Generation Y.

This research makes valuable contributions to theory by bridging the gap in studies regarding user satisfaction with American and Chinese chatbots and highlighting the impact of different demographic characteristics on satisfaction ratings. These provide a cutting-edge reference for future research in related fields. The insights from this study will also assist industry stakeholders in understanding user satisfaction in Taiwan, potentially aiding them in optimizing language comprehension and generation technologies for different regional responses.

Synthesizing the aforementioned analysis and empirical findings, this study makes the following recommendations. First, for the development and optimization of chatbots, this study suggests strengthening the research and development of technologies for regional language understanding and response generation to enhance accuracy and satisfaction in addressing diverse user needs. Specifically, the introduction of a broader array of language model training methods, combined with regional language databases, could improve the capabilities of chatbots in language comprehension and response generation. Second, future research should delve into the usage needs and preferences of different gender and generational groups. Given that significant variations may exist in the expectations and requirements for chatbots among different genders and generations, developers and researchers should analyze and study these differences to design chatbots that better meet the diverse expectations and needs of users.

In terms of suggestions for subsequent research, this study acknowledges the limitation of our sample size and recommends that future studies expand the participant pool to validate the findings of this study. Furthermore, additional research extensions, such as examining participants' technological proficiency and prior technology use experiences, would offer more comprehensive results. Finally, in light of the rapid development and expanding applications of chatbot technology, it is recommended that future research strengthen cross-cultural and cross-regional comparisons. By exploring the acceptance and satisfaction with chatbots among users from different cultural and regional backgrounds, not only can a deeper understanding of chatbot user satisfaction be achieved, but the development and application of chatbots across various regions will be facilitated.

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