

UX Research on Chabot-Guided Tours: A Case Study of the YunTech USR Exhibition

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Abstract

Chatbots have increasingly gained popularity in museums and exhibitions, enhancing visitors' self-guided tour experiences. Compared to traditional tours, chatbots offer more personalized interactions, providing new version to the exhibition. This study, taking the YunTech Sustainable Expo as a case, explores whether visitors with varying levels of technological experience require more guided experiences on Chatbot-guide. Employing survey research through the Facebook Messenger platform to integrate chatbots, the sample consisted of visitors who have used Messenger and visited the exhibition. A total of 148 questionnaires were collected, analyzed descriptively, and subjected to t-tests. The reliability analysis of the questionnaire showed a Cronbach's alpha of 0.832, indicating high reliability, and factor analysis revealed two main factors: satisfaction with effectiveness and interactive experience. The guide chatbot can enhance interactive experience and satisfaction. The system design is reasonable and easy to use, but operational procedures and interface design need optimization, including enhanced guidance for beginners and real-time help features. In providing more exhibition information, it is essential to balance the amount of information to meet the needs of most visitors. It is recommended to offer personalized options, use AI and machine learning technologies to optimize response accuracy and interactivity, add multimedia content to enhance visual and auditory experiences. For neutral and dissatisfied visitors, further investigation into their needs is necessary for targeted improvements, continuously optimizing system functions and improving service quality to gradually increase overall user satisfaction.

Keywords: Chatbot-Guide, User Experience, Digital Guide, Usability Evaluation

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1. Introduction

Over the past few years, text messaging-based conversational agents (CAs), commonly known as chatbots, have garnered widespread attention. These chatbots, utilized on social media or chat messaging platforms, offer the convenience of no-download installation (Jain, Kumar, Kota, & Patel, 2018). Initially, their application was limited to simulating human conversation, but with technological advancements, their scope has expanded to various fields, including initial consultation services and precise customization needs, developing into intelligent assistants providing advisory services (Abokhodair, Yoo, & McDonald, 2015; Woolley, 2016; Chaves & Gerosa, 2021). Recently, chatbots have emphasized the portability of mobile devices and sensor functionalities, offering personalized user experiences (Haugeland, Følstad, Taylor, & Bjørkli, 2022). However, such technology often faces challenges due to a lack of interaction with visitors and the inability to continuously update, which can affect visitors' attention to exhibits (Varitimiadis, Kotis, Pittou, & Konstantakis, 2021).

In recent years, exhibitions have increasingly become visitor-centered (Sheng & Chen, 2012), and visitors now require not just flashy technological applications, but also an understanding of the narrative, creativity, and humanized interactive technology of the exhibition (Følstad & Taylor, 2021). The services provided by chatbots can offer valuable and enjoyable experiences for visitors, increasing their dependence on them (Bernhaupt, 2010). Therefore, designers should carefully evaluate and test the chatbot experience services to understand the key factors of visitor experience (Følstad & Taylor, 2021). In the application of chatbots, the most common issues are the naturalness of responses and whether the script design meets visitor needs. This can be achieved through computer programs that simulate human conversation via text or voice interactions (Schaffer, Gustke, Oldemeier, & Reithinger, 2018), with the dialogue framework functionality and knowledge graph script design being crucial (Khawan, 2021; Shawcroft, Gale, Workman, Leiter, Jorgensen-Wells, & Jensen, 2022).

Research indicates that chatbots have great potential in tour guide services, as they can address issues such as staff shortages, emergency scheduling, and interruptions in traditional guided tours (Sernani et al. 2020). This is because traditional digital tour guide systems are often one-way and cannot answer visitor questions, whereas chatbots offer a new solution (Bahja, Hammad, & Hassouna, 2019). Many studies have explored user experiences with chatbots (Følstad & Brandtzaeg, 2020); however, this study aims to examine whether there are significant differences in satisfaction and interactive experience with chatbots among visitors with varying levels of technological experience. Additionally, the study seeks to identify the most common problems and challenges faced by visitors when using chatbots and provide recommendations for improving chatbot design based on the research findings.

2. Literature Review

2.1 History and Development of Chatbots

In 1995, with the rapid development of the internet, ALICE became the first chatbot to use the "Turing test" to mimic human conversation (Al-Amin et al., 2024). In 2001, ActiveBuddy developed SmarterChild for AOL Instant Messenger, marking a turning point for conversational agents (CAs). SmarterChild was able to provide various services and interact with databases, but it still had significant limitations (Lessio & Morris, 2020). The emergence

of smartphones and advancements in natural language processing (NLP) led to the creation of more advanced voice-activated chatbots (Nimavat & Champaneria, 2017; Kepuska & Bohouta, 2018). Although chatbots have existed for decades, they only gained widespread attention in the spring of 2016. This resurgence was driven by major advancements in artificial intelligence (AI) and a large-scale shift from online social networks to mobile messaging applications such as Facebook Messenger, Telegram, Slack, Kik, and Viber (Brandtzaeg & Følstad, 2018).

By 2020, further advancements in AI, machine learning, and deep learning had revolutionized chatbots. These chatbots were capable of more complex contextual conversations and were applied in various fields, including customer service, psychological counseling, and personal assistants (Varitimiadis et al., 2020; Ashfaque, 2022; Casheekar et al., 2024).

In summary, with improvements in the design and functionality of chatbots, they have gradually been applied in the fields of education and entertainment in recent years (Sernani et al. 2020). They are particularly well-suited for use on mobile devices that support visual, voice, and touch interactions (Bahja, Hammad, & Hassouna, 2019). These applications not only enhance learning outcomes but also allow users to become more deeply immersed in the learning process (Fadhil & Villafiorita, 2017; Clarizia et al., 2018; Ruan et al., 2019).

2.2 Applications of Chatbots

Museums utilize chatbots as digital guides or simple Q&A information agents, and sometimes even in more complex roles as tour planners to enhance visitor engagement (Tzouganatou, 2018). Current examples include:

Anne Frank House Chatbot: Set up on Facebook Messenger, it guides visitors through exhibits using buttons to prevent confusion. The chatbot is designed to operate within the museum's context to avoid inappropriate behavior (Boiano et al., 2018; Tzouganatou, 2018).

Maxxi's Chatbot: Developed using Google's Dialogflow and integrated into the museum's Facebook page, it guides users along specific routes through text or images, enhancing user engagement with multimedia content, rewards, and well-crafted conversations (Engineering, 2024).

Di Casa In Casa Adventour Chatbot: Developed on the Wit.ai platform, this chatbot uses gamification techniques to attract visitors through a treasure hunt by finding clues and learning new things. Despite lacking free conversation skills, it creates realistic nonlinear narrative dialogues to engage visitors (Boiano et al., 2018; Tzouganatou, 2018).

Based on the services provided by the above chatbots, they can be categorized into three types:

- (A) Simple QA information chatbots that provide basic information about the exhibition areas and exhibits with limited conversational abilities.
- (B) Chatbots with predefined routes, where visitors obtain exhibition information through pre-defined dialogue paths with limited conversational abilities.
- (C) Gamified and reward chatbots, where visitors follow dialogue paths and are attracted by rewards and gamified functions such as treasure hunts, with limited conversational abilities.

These classifications help in understanding the application scope and functionality of chatbots.

2.3 User Experience Design in Chatbots

Chatbots have rapidly developed and become prevalent in fields such as healthcare, education, and consumer services. Thus, considering their usability in design is crucial (Kuhail, Farooq, & Almutairi, 2023). Visitor experience encompasses emotions, preferences, perceptions, and reactions before, during (ISO, 2019), and after using the interactive system, influenced by two main factors: pragmatic quality (usefulness, effectiveness, and efficiency of the system) and hedonic quality (pleasure aspects of interaction, including system stimulation, identification, and arousal capabilities). According to the hedonic-pragmatic model, solutions with strong pragmatic and hedonic qualities may be precisely what users need (Haugeland, Følstad, Taylor, & Bjørkli, 2022).

Chat design has gained significant attention in recent years and is an essential process for developing effective chatbots. It includes observing visitor interactions, defining visitor goals, shaping dialogues, determining agent roles, presetting messages, and conducting prototyping and testing (Moore & Arar, 2019). Before designing the interaction scripts for chatbots, it is necessary to understand the chatbot's purpose, target audience, and the types of tasks that need to be completed. Chatbots should have rich interactive features, such as audio, images, and maps, to provide a good visitor experience (Pricilla, Lestari, & Dharma, 2018).

Some researchers have proposed preliminary frameworks for designing content adaptive to mobile web and evaluating how handheld devices interact with visitors to enhance the exhibition experience (Noh & Hong, 2021). With the application of new technologies in exhibitions, many studies have begun investigating how to measure visitors' subjective experiences to better understand how they enjoy and experience exhibitions. Some information systems research indicates that for inexperienced users, system usefulness is the most important factor in determining whether they use it, while experienced users may consider other factors. Therefore, user experience design is relatively important for chatbots.

2.4 Summary

Chatbots have significantly changed and enhanced tour guide services by enabling two-way interaction and providing better visitor experiences. This study investigates whether there are significant differences in satisfaction and interactive experiences with chatbots among visitors with varying levels of technological experience and how chatbots impact overall satisfaction.

3. Research Design

This study employs a case study method, which is primarily a method for studying real-life situations or events (Hoa, Huy, Le Thi Thanh Huong, & Trung, 2021). It focuses on the first-time introduction of chatbots at the YunTech USR Exhibition, with a clear scope and specific application context, demonstrating significant research value.

For data collection, a questionnaire survey was primarily used, utilizing the online system Survey Cake for compilation and analysis. Facebook Messenger was chosen as the communication tool to conveniently set up the YunTech USR Exhibition-specific chatbot,

offering real-time messaging, voice, video, and multimedia sharing functionalities. The research was conducted in August 2022 at the YunTech USR Exhibition during the Asia-Pacific Expo in Taipei. Visitors were required to experience the chatbot before filling out the questionnaire. A total of 148 questionnaires were collected and subjected to descriptive analysis and t-tests. The reliability analysis of the questionnaire showed a Cronbach's alpha of 0.832, indicating high reliability.

Through questionnaire surveys, it analyzes the problems and challenges visitors encounter during usage and proposes improvement suggestions. The research framework is shown in Figure 1.

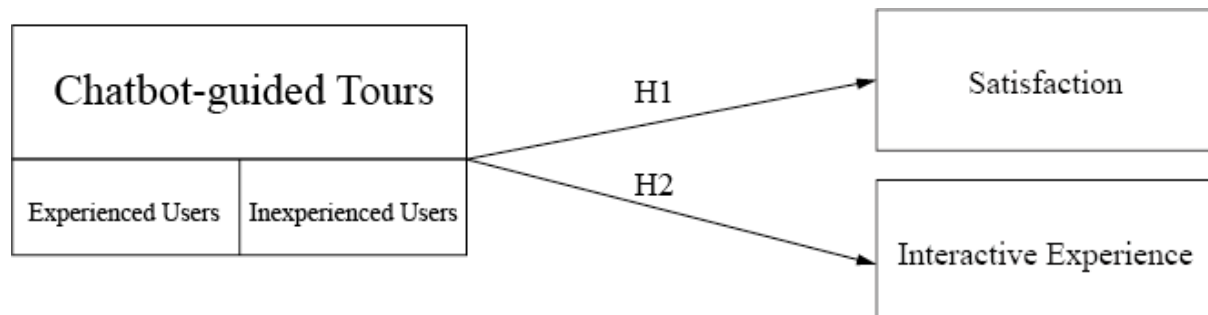


Figure 1: Research Framework

The average age of the visitors was 37 years, with 66.2% being female and 53.3% having a college degree. 97.2% of the visitors had used Facebook Messenger, and 64.1% had used similar chatbots before. The questionnaire included questions on demographic characteristics, social media experience, and chatbot experience. The remaining items used a five-point Likert scale (1-strongly disagree to 5-strongly agree) with a total of 12 questions, including positive and negative items to assess visitors' perceptions of the chatbot. The questionnaire is shown in Table 1.

Table 1: Questionnaire Items

No.	Questionnaire Items
1	I found this guide chatbot helped me understand the tour content more effectively.
2	I encountered many confusing operations while using the guide chatbot.
3	The process of using the guide chatbot was very smooth.
4	I didn't know how to use the guide chatbot and had to try and error.
5	This guide system assisted me in understanding the tour content smoothly.
6	I hope the guide chatbot provides me with more exhibition information.
7	I do not need the guide chatbot to provide additional information.
8	This guide chatbot did not meet my needs for understanding the exhibition content.
9	I am satisfied with the service of this guide chatbot.
10	If I had the choice, I would prefer to explore the exhibition by myself rather than using the guide chatbot.
11	Compared to exploring the exhibition by myself, I would prefer to use the guide chatbot to help me understand the content and plan my visit.
12	Using this guide chatbot was a frustrating experience.

The script design of the YunTech USR chatbot references design features from literature cases. Using Facebook Messenger as the platform, the chatbot was built with carefully

planned scripts to guide visitors along predetermined tour routes, introducing the achievements of YunTech USR. Two tour routes were established, ensuring that visitors could find the exhibition exit. Visitors answered questions via multiple-choice or searched for answers within the exhibition, experiencing a treasure hunt concept and ultimately completing the mission.

The script outline is divided into two stages: the first stage includes welcome content, and the second stage introduces the YunTech campus, providing campus photos and relevant website links. The chatbot guides visitors into the campus, allowing them to choose between static or dynamic exhibition routes, and presents riddles during the tour. After completing the puzzle-solving tasks, visitors find the exhibition exit path, receive virtual badges, and redeem rewards. The script was planned using XMind mind mapping software, which can quickly link contextual information and clearly guide the tour routes.

4. Analysis and Discussion

Factor analysis revealed that satisfaction and interactive experience are the two main factors in evaluating the effectiveness of chatbots. T-test data showed no significant difference in interactive experience and satisfaction between visitors with and without chatbot experience, indicating that the Facebook Messenger chatbot provides stable and balanced service, is friendly to beginners, and is easy to use.

Most visitors (83%) found that the guide chatbot effectively helped them understand the exhibition content, with only 7.3% dissatisfied. This indicates that the system is efficient in information delivery and auxiliary understanding and is reliable in most cases. 9.4% of visitors were neutral, suggesting further research is needed to understand their needs and expectations to improve satisfaction. Overall, the guide chatbot received recognition from the vast majority of visitors, showing that its design and functionality are practical and effective in real applications.

Most visitors (79.6%) found the operation smooth, but 14.8% were neutral, and 5.4% found the operation not smooth, indicating potential design or technical deficiencies in certain aspects. 84.3% of visitors believed the chatbot helped them understand the tour content smoothly, 12.8% were neutral, and 2.6% were dissatisfied. This shows that the system works well in most cases but still needs optimization to address the needs and issues of a minority of users.

Most visitors (83%) were satisfied with the service of the guide chatbot, with only 3.3% dissatisfied. 72.2% of visitors were willing to use the guide chatbot to help understand the exhibition content and plan their visit, 21.6% were neutral, and 6% were dissatisfied, indicating that the guide chatbot is an effective and popular tool for most visitors.

Visitor preferences for using the guide chatbot were divided, with 31.7% not wanting to use it, 34.4% neutral, and 33.6% liking it. This shows significant differences in visitor needs and preferences for the guide chatbot, suggesting designers should offer flexible choices and personalized services.

29.6% of visitors found many confusing operations with the guide chatbot, 27.7% were neutral, and 42.5% found no confusing operations, indicating divided opinions on operation confusion. However, there is a need to optimize operational elements and interface design.

50.6% of visitors believed there was no confusion during the usage process, 21.6% were neutral, but nearly half of the visitors had doubts about the operation, indicating a need for further optimization of operational procedures and interface design.

60.7% of visitors did not feel frustrated using the guide chatbot, but nearly 40% had doubts or dissatisfaction with the usage experience, indicating a need for further optimization of operational procedures and interface design. 79% of visitors wanted the guide chatbot to provide more exhibition information, 16.8% were neutral, and 4% found the current information sufficient. This shows that most visitors want more information to deepen their understanding and exhibition experience.

33.7% of visitors thought additional information could be added, 19.5% were neutral, and 46.5% thought no more information was needed. This indicates that some visitors want more auxiliary information, but most believe the existing information is sufficient. Designers need to carefully consider adding information to avoid information overload and provide personalized tour path options.

5. Conclusion

Overall, the guide chatbot can enhance interactive experience and satisfaction. The system design is reasonable and easy to use, but operational procedures and interface design need optimization, including enhanced guidance for beginners and real-time help features. In providing more exhibition information, it is essential to balance the amount of information to meet the needs of most visitors. It is recommended to offer personalized options, use AI and machine learning technologies to optimize response accuracy and interactivity, add multimedia content to enhance visual and auditory experiences. For neutral and dissatisfied visitors, further investigation into their needs is necessary for targeted improvements, continuously optimizing system functions and improving service quality to gradually increase overall user satisfaction.

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