

Chatbots applications in civil aviation passenger service: A scoping review

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Abstract. With the continuous development and popularization of artificial intelligence technology, chatbots, as an innovative service tool, are gradually demonstrating their significant application potential in the field of civil aviation. Chatbots can engage in real-time interactions with passengers through natural language processing technology, providing personalized services. This scoping review aims to provide a preliminary analysis of the current status, advantages, challenges, and future prospects of chatbot applications in the field of civil aviation passenger services. This review was conducted in accordance with the PRISMA extension for scoping reviews guidelines. Studies were identified by searching five prominent databases - Scopus, ACM, IEEE Xplore, Springer Link, and Web of Science - covering the period from 2015 to 2024. Chatbots have demonstrated significant potential in various applications within civil aviation passenger service, including flight inquiries, ticket booking, customer support, and baggage tracking. Existing literature indicates that chatbots can significantly enhance passenger satisfaction and loyalty by providing personalized and convenient service experiences. Additionally, they can reduce operating costs and improve service efficiency for civil aviation participants. However, challenges such as technical limitations in natural language processing and privacy protection issues remain to be addressed.

Keywords: Chatbots, Civil Aviation, Airports, Airlines, OTAs, Passenger ServiceIntroduction.

1. Introduction

1.1. Background

With the rapid development of the global aviation industry, passenger demand for civil aviation passenger services is continuously increasing. Traditional manual service models have struggled to meet these growing passenger needs. As Yi [1] mentioned, artificial intelligence technology is used to optimize the sorting of flight information and enhance the customer service experience. Chatbots, as a crucial application of artificial intelligence technology, leverage natural language processing technology to enable intelligent interactions with passengers, providing them with more convenient and efficient service experiences[2]. Chatbots, as an innovative service tool, are gradually demonstrating their significant application potential in the field of civil aviation. Chatbots can engage in real-time interactions with passengers through natural language processing technology, providing personalized

services, and thus are expected to significantly enhance passenger service quality and operational efficiency. However, the application of chatbots in civil aviation passenger service is still in its infancy, and its actual effects and challenges need further evaluation.

1.2. Research Problem and Aim

Studying the application of chatbots in civil aviation passenger service is significant for enhancing passenger satisfaction[3], optimizing service processes, and reducing operating costs. By summarizing existing literature and application cases, this research aims to provide theoretical support and practical guidance for the future application of chatbots in the civil aviation sector.

2. Methods

2.1. Overview

We conducted a scoping review of Civil Aviation Passenger Service-related chatbots, focusing on the technical foundation, the application scenarios, and the implementation effect. We reported according to the PRISMA guidelines[4] for scoping reviews, which outline steps from protocol development and search strategy to charting results and reporting findings.

2.2. Review Objective

This scoping review aims to provide a preliminary analysis of the current status, advantages, challenges, and future prospects of chatbot applications in the field of civil aviation passenger services.

2.3. Review Questions

Review questions were as follows:

- What is the technical foundation of customer service chatbots?
- What are the application scenarios of chatbots in civil aviation passenger service?
- What is the implementation effect of existing chatbots in civil aviation passenger service?
- What are the challenges and opportunities for chatbots in civil aviation passenger service?

2.4. Data Sources

Studies were identified by searching five prominent databases - Scopus, ACM, IEEE Xplore, Springer Link, and Web of Science - covering the period from 2015 to 2024.

2.5. Selection Criteria

Inclusion criteria included studies that focused on the application of chatbots in civil aviation passenger service, described application scenarios and implementation effects, and were academic papers or conference papers. Exclusion criteria included non-academic literature and literature unrelated to civil aviation passenger service.

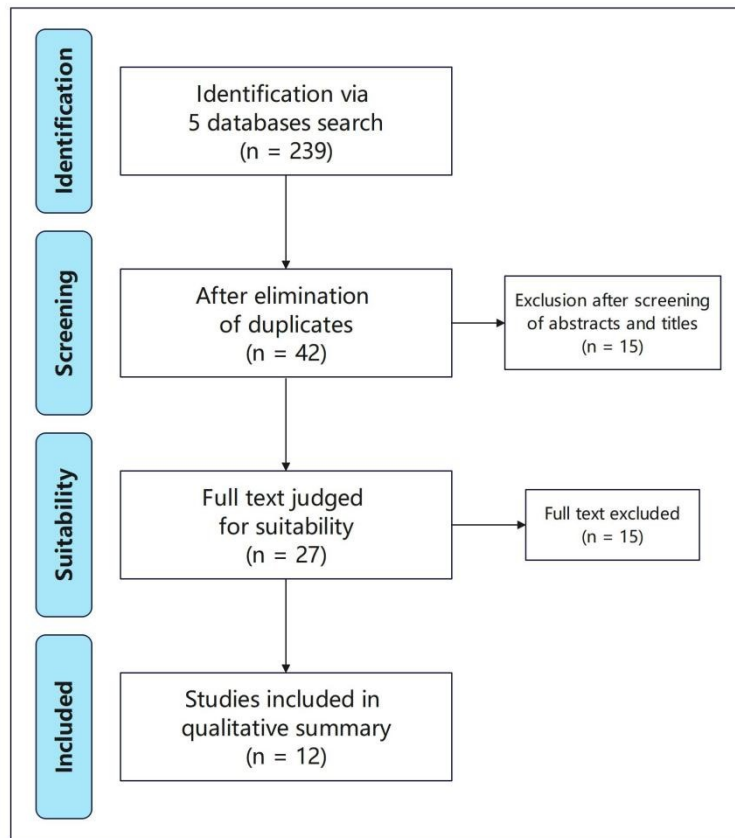


Figure 1. Search process of the literature included in the review.

2.6. Data Analysis

Selected literature was coded, classified, and analyzed using thematic analysis, summarizing and categorizing the literature content from application scenarios, implementation effects, challenges, and opportunities.

3. Relevant Literature

3.1. Definition and Classification of Chatbots

Although the technology of chatbots is not new, the advancement of artificial intelligence (AI) and machine learning in recent years, as well as the widespread adoption of messaging platforms, have led companies to explore chatbots as a supplement to customer service. Chatbots are computer software that interacts with users through natural language processing (NLP)[5] or hybrid frameworks, such as language model (LM), long short-term memory (LSTM), convolutional neural network (CNN), and conditional random field (CRF) mix technology[6]. Depending on their functions and design principles, chatbots can be classified into task-oriented, non-task-oriented, rule-based, and AI-based types[7]. Task-oriented chatbots focus on completing specific tasks such as flight inquiries[8] and baggage tracking, while non-task-oriented chatbots emphasize natural communication with users. Rule-based chatbots interact with users through preset rules and pattern matching, while AI-based chatbots utilize deep learning and other technologies to achieve higher levels of natural language understanding and generation[9]. Chatbots have been widely used in many areas, such as tourism, civil aviation, healthcare and education[10]. In civil aviation passenger service, chatbots provide services such as flight inquiries, baggage tracks and Inquiries in emergency situations[11]. The application of chatbots in the medical field is generally in the prevention, treatment, follow-up, and recurrence prevention of psychological

problems and mental disorders[12]. These application cases provide valuable experience and reference for the application of chatbots.

3.2. Civil aviation passenger service

From the perspective of civil aviation IT suppliers, there are three main civil aviation participants: airlines, airports, and ticket agents or online travel agencies (OTAs). Simultaneously, the civil aviation sector and the tourism sector share some overlapping areas. In order to provide a good travel experience, civil aviation participants must provide good Passenger Service to ensure that customers can obtain the required information smoothly and in a timely manner[13].

In China, airlines, airports and OTAs have successively used chatbots to replace traditional text customer service[14]. Airlines in world wide provide chatbot services through their official websites or mobile applications, offering passengers functions such as flight inquiries, ticket bookings, and customer support[15]. These preliminary applications demonstrate the significant potential of chatbots in civil aviation passenger service but also reveal issues such as privacy protection.

4. Results

4.1. Technical Foundation of passenger service chatbots

Chatbots use artificial intelligence technology, especially machine learning and natural language processing[16], to simulate natural language conversations with humans. Due to its fast response and user-friendly features, chatbots are commonly used as conversational applications in business, transportation, education, and other fields. Chatbots are integrated into mobile applications, websites, and social media, improving the passenger service capabilities of civil aviation participants.

4.2. Application Scenarios of Chatbots in Civil Aviation Passenger Service

In order to provide a good travel experience, airlines[17] and airports[13] provide excellent passenger service through the use of chatbots, ensuring that customers can smoothly and timely obtain the necessary information. OTAs such as Makemytrip, Expedia, Kayak, Skyscanner and Cheapflights have started using chatbots to serve customers. A survey by Aspect Research Software indicates that 44% of consumers are looking forward to using AI-based chatbots instead of human customer service representatives[18]. Although there is research on chatbots in the civil aviation industry, academic research on their adoption, technological evolution, and impact on the industry is still relatively scarce[16].

4.3. Implementation Effect of Chatbots

Human interaction in online environments can be expensive and limited. Providing automated and conversational information interfaces is increasingly becoming a viable support solution. With the assistance of chatbots, Ctrip passenger service can save more than 10 thousand working hours per day, which is equivalent to freeing up thousands of customer service personnel per day[19]. Chatbots also can significantly enhance passenger satisfaction and social presence[20] by providing personalized and convenient service experiences. Among civil aviation participants, the application of chatbots is a major trend and future research direction in the field of passenger services[21].

4.4. Challenges and Opportunities

Chatbots can serve as a powerful supplement to passenger service as they are more cost-effective and tireless. However, passengers facing services have to face data security and privacy issues[22]. With the widespread application of chatbots, security and privacy issues are key challenges that need to be addressed[23]. Passenger service is just an emerging application area for chatbots, and it has not yet been widely adopted among the target customer group. Our understanding of passengers' trust in chatbots and the factors that influence this trust is very limited, which is a key issue for enhancing passenger service through chatbots[24]. When the chatbot's response is incorrect, passengers' trust in

the chatbot will be greatly affected[25]. Considering the increasing prevalence of chatbots in the civil aviation industry, stakeholders should strive to not only optimize cost-effectiveness but also cultivate users' interest and intrigue in this technological advancement[26]. As these AI-driven systems continue to evolve and improve, it is anticipated that customer service interactions will eventually transition towards a fully automated chatbot-centric approach.

5. Discussion

5.1. Opportunities, Challenges, and Limitations for Chatbot Applications in Civil Aviation Passenger Service

Chatbots provide strong support for improving the service experience and operational efficiency of civil aviation passengers. However, challenges such as data security and privacy protection cannot be ignored in the application process. However, chatbots can significantly improve passenger service quality and operational efficiency in civil aviation. But currently, the usage scenarios of chatbots are relatively limited. Further improving the functional modules of chatbots in the future can enhance passenger satisfaction and loyalty and reduce operational costs for civil aviation participants.

5.2. Future Prospects and Research Gaps

Future research can further explore the application effects of chatbots in different civil aviation participants and passenger groups, as well as how to improve the intelligence level and passenger acceptance of chatbots through technological innovation and strategic adjustments. Enhancing the ability of chatbots to understand and process complex queries. In addition, the integration effect of chatbots with other service channels can also be studied, as well as how to use chatbots to collect and analyze passenger feedback to further optimize the passenger service experience.

6. Conclusion

6.1. Summary of Findings

This study systematically reviewed existing literature and found that chatbots have demonstrated significant potential in various applications within civil aviation passenger service, providing passengers with more convenient and efficient service experiences, reducing civil aviation participants' operating costs and improving service efficiency. However, challenges such as technical limitations and privacy protection must be addressed to better harness their potential.

6.2. Practical Suggestions

In response to the aforementioned issues and challenges, this paper proposes the following practical suggestions for civil aviation participants to consider and adopt: Firstly, strengthen technological research and development as well as innovation capacity building, continuously enhancing the technical level and application effectiveness of chatbots in natural language processing and other aspects, in order to meet the growing needs and expectations of passengers. Secondly, data security and privacy protection measures should be reinforced to ensure the confidentiality and security of passenger personal information are not infringed upon or compromised. Thirdly, efforts should be intensified in developing cross-platform application capabilities and data sharing mechanisms to achieve goals such as interconnectivity and data sharing between different civil aviation participants, thereby further enhancing the application effectiveness and value of chatbots in civil aviation passenger services.

6.3. Future Research Directions

Future research can further explore specific application scenarios and implementation effects of chatbots in civil aviation passenger services, and propose more concrete and feasible optimization plans and improvement measures based on actual situations, in order to promote the widespread application and profound development of chatbots in civil aviation passenger services. Additionally, research can also

delve into innovative application modes and prospects of chatbots in civil aviation passenger services by considering the development and application of other emerging technologies such as blockchain and the Internet of Things.

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