

Research Article

Improving Customer Service and Satisfaction in Indonesian Digital Banks with AI-Powered Chatbots

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Abstract: The integration of Artificial Intelligence (AI) chatbots into customer service operations within digital banks has become a transformative trend in the banking sector, particularly in Indonesia. This study examines the effectiveness of AI chatbots in improving both operational efficiency and customer satisfaction in three selected Indonesian digital banks. The research focuses on evaluating the impact of AI chatbots in reducing response times, handling high volumes of customer inquiries, and improving service availability. The study also delves into customer feedback, measuring satisfaction with the ease of use, personalization, and responsiveness of the AI systems. The results demonstrate that AI chatbots significantly enhance customer service efficiency by reducing wait times and automating routine inquiries, which reduces the need for human intervention. Additionally, customers reported high satisfaction with the round-the-clock availability of AI chatbots and the personalized financial advice provided. However, despite these benefits, challenges related to data security, chatbot accuracy, and customer adaptation to automated systems remain prevalent. Data privacy concerns and issues regarding the chatbot's ability to handle complex queries were noted as limiting factors in customer trust and satisfaction. The study highlights the implications of these findings for the future of digital banking in Indonesia, emphasizing the need for improved chatbot integration, stronger data security measures, and enhanced user experience design. The integration of AI in customer service operations holds significant potential for digital banks and the broader financial sector to improve operational efficiency, reduce costs, and meet the evolving expectations of customers.

Keywords: AI Chatbots; Customer Satisfaction; Data Security; Digital Banking; Operational Efficiency.

1. Introduction

The digital banking sector in Indonesia has undergone significant evolution in recent years, a trend that has been accelerated by the COVID-19 pandemic. Traditional banking methods have transitioned towards more advanced digital platforms, driven by an increasing demand for convenience, accessibility, and efficiency in financial services (Zaki, Halim, & Hebrard, 2023). Early mobile banking systems have evolved into sophisticated digital banking ecosystems, offering a wide range of services via mobile applications. This transformation is also evidenced by a considerable increase in electronic money transactions and the overall value of digital banking transactions (Tanika, Hartanto, & Tanjung, 2022). The rise of digital banking has been further bolstered by regulatory frameworks that aim to foster a robust digital banking ecosystem, thus promoting a secure and efficient environment for both businesses and consumers (Tribroto, Hamzah, & Hakim, 2023).

In parallel with the rise of digital banking, Artificial Intelligence (AI) chatbots have emerged as a crucial tool for improving customer service within the banking sector. AI chatbots leverage advanced technologies such as Natural Language Processing (NLP) and Machine Learning (ML) to provide real-time, personalized support to users. These chatbots enable financial institutions to automate routine inquiries and handle repetitive tasks, which significantly improves customer service efficiency (Rani et al., 2024). The integration of AI chatbots allows banks to deliver 24/7 assistance, providing round-the-clock support to customers (Wang, Lin, & Shao, 2022). Moreover, by analyzing user interactions, these systems can offer personalized experiences, enhancing both user satisfaction and overall service quality (Khneyzer, Rebeiz, & Touma, 2024).

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The primary purpose of incorporating AI chatbots into customer service is to improve both operational efficiency and user satisfaction. These chatbots streamline processes by automating tasks, reducing the need for human intervention, and enabling faster responses to customer inquiries (Bouras et al., 2023). They also provide valuable data insights, which allow businesses to tailor services more effectively to meet customer needs (Vashishth, Sharma, Sharma, & Sharma, 2024). Furthermore, AI chatbots offer significant cost savings for banks by decreasing the dependency on human agents for routine tasks (Rani et al., 2024). Through these advancements, AI chatbots contribute significantly to improving the overall quality of service, ensuring that digital banks can meet the evolving expectations of customers while maintaining competitiveness in a rapidly changing market (Sujanto et al., 2024).

2. Literature Review

Artificial Intelligence in Banking: Overview of AI Applications in the Banking Sector, Focusing on AI Chatbots

Artificial Intelligence (AI) is rapidly transforming the banking sector, bringing a range of advancements that improve productivity, reduce operational costs, and enhance customer satisfaction (Polireddi, 2024). AI applications in banking are diverse, with prominent use cases including predictive analytics, fraud detection, automated decision-making, and AI-powered chatbots (Rana et al., 2023). Among these, AI chatbots stand out as a revolutionary tool for customer engagement. These chatbots leverage Natural Language Processing (NLP) and Machine Learning (ML) algorithms to provide 24/7 support, facilitate transactions, and offer personalized financial advice (Khan & Rabbani, 2020). By automating routine inquiries, chatbots enable banks to efficiently manage high volumes of customer requests, offering faster response times and improving service availability (Bhatnagar, Rajesh, & Misra, 2024). This has significantly contributed to the rise of AI in banking, making it an integral part of digital banking strategies worldwide (Polireddi, 2024).

Service Management in Digital Banks: Role of AI Chatbots in Service Delivery

AI chatbots have become crucial in enhancing operational efficiency within digital banks. One of the primary advantages of chatbot implementation is the handling of a large number of customer queries simultaneously, reducing waiting times and improving service accessibility (Rana et al., 2023). In addition, AI chatbots reduce the need for extensive human labor by automating repetitive tasks, which results in substantial cost savings for banks (Dewasiri et al., 2024). Furthermore, these chatbots provide round-the-clock assistance, ensuring that customers can access services and resolve inquiries at any time, thus increasing customer satisfaction (Singh et al., 2023).

Despite the advantages, there are several operational challenges that AI chatbots face in the banking sector. One of the major concerns is data security and privacy, as ensuring the safety of sensitive customer information is paramount (Dewasiri et al., 2024). Chatbots must also be highly accurate in their responses to maintain customer trust, which can be a challenge given the complexity of certain inquiries (Kondybayeva et al., 2024). Another challenge lies in the integration of AI chatbots with legacy banking systems, which requires careful planning and resources to ensure smooth operation (Rana et al., 2023).

Customer Satisfaction: Link Between AI-Driven Customer Service Tools and User Satisfaction in Digital Banking

AI-driven tools, particularly chatbots, have had a profound impact on customer satisfaction within digital banking. One of the key reasons for their effectiveness is their ability to offer personalized services through the analysis of user data, thus tailoring interactions to meet individual customer needs (Bhatnagar et al., 2024). Chatbots use machine learning and natural language processing to offer personalized financial advice, improving the overall customer experience (Khan & Rabbani, 2020). Additionally, the speed and efficiency of chatbots in resolving queries and completing transactions further enhance customer satisfaction (Singh et al., 2023). Studies have shown that AI-driven customer service tools lead to higher levels of trust and reliability among customers, as chatbots can provide accurate, timely, and secure services (Widjaja & Legowo, 2024).

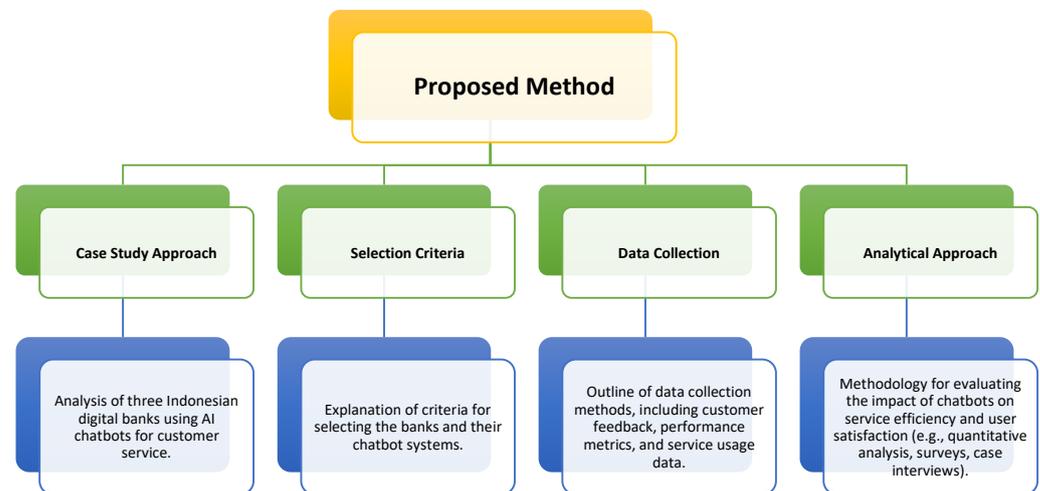
Empirical evidence supports the positive impact of AI chatbots on customer satisfaction. Research in the Indonesian banking sector indicates that various dimensions of chatbot service quality—such as interaction, entertainment, trendiness, customization, and problem-solving—have a significant influence on customer satisfaction (Widjaja & Legowo,

2024). Furthermore, customers tend to have positive perceptions of AI-driven e-services in banking, with a strong emphasis on the importance of efficiency, trust, and personalized service (Polireddi, 2024).

However, challenges remain in ensuring continued customer satisfaction. Data privacy concerns and the need for ongoing technological updates are some of the issues that may affect customer satisfaction (Kondybayeva et al., 2024). Additionally, while chatbots excel at managing routine inquiries, customers may still prefer human interaction for more complex or nuanced issues (Rana et al., 2023). This highlights the need for a balanced approach in integrating AI chatbots within customer service strategies.

3. Materials and Method

This study uses a case study approach to analyze AI chatbot implementation in three Indonesian digital banks. The selection criteria include active use of AI chatbots, digital banking status, variety in chatbot features, and data accessibility. Data will be collected through customer surveys, interviews, performance metrics, and service usage data. Quantitative analysis will evaluate chatbot efficiency and customer satisfaction, while qualitative methods, including in-depth interviews, will explore operational challenges and benefits. This approach will provide insights into the impact of AI chatbots on service efficiency and user satisfaction in the digital banking sector.



Figur 1. The structure of the Research Methodology flowchart.

Case Study Approach: Analysis of Three Indonesian Digital Banks Using AI Chatbots for Customer Service

This study adopts a case study approach to analyze the use of AI chatbots in customer service at three selected digital banks in Indonesia. A case study approach allows for an in-depth exploration of real-world applications and outcomes, focusing on the specific context of AI chatbot adoption in banking. By examining these cases, the study aims to gain insights into the challenges and benefits of implementing AI chatbots and their impact on customer service operations and user satisfaction.

Selection Criteria: Explanation of Criteria for Selecting the Banks and Their Chatbot Systems

The selection of banks for this case study is based on the following criteria: a.) Active Use of AI Chatbots: Only banks that actively utilize AI chatbots for customer service will be included. This ensures that the research focuses on relevant cases where chatbots are integral to the service delivery process. b.) Digital Bank Status: The selected banks must be classified as digital banks, meaning they primarily operate through online platforms and digital services, such as mobile applications and internet banking. c.) Variety of Chatbot Features: The banks should have chatbot systems with a range of functionalities, including natural language processing (NLP), machine learning capabilities, and personalized responses, which can provide a broad perspective on chatbot performance. d.) Data Accessibility: The selected

banks must allow access to relevant data, such as customer feedback, service performance metrics, and chatbot usage statistics, to ensure comprehensive data collection for the study.

Data Collection: Outline of Data Collection Methods

The data collection process will involve both qualitative and quantitative methods: a.) Customer Feedback: Surveys and interviews will be conducted with customers who have interacted with the AI chatbots. These surveys will measure customer satisfaction, trust, and the perceived effectiveness of the chatbots in handling inquiries. Interviews will provide deeper insights into customer experiences and any challenges encountered while using the chatbots. b.) Performance Metrics: Data on operational metrics, including response time, resolution rate, and chatbot usage frequency, will be gathered from the banks' internal systems. This data will help evaluate the efficiency of the chatbots in handling customer queries. c.) Service Usage Data: Information on chatbot usage, such as the number of interactions, transaction volumes, and customer engagement, will be collected to assess the impact of AI chatbots on service operations and customer satisfaction.

Analytical Approach: Methodology for Evaluating the Impact of Chatbots on Service Efficiency and User Satisfaction

The analysis will combine both quantitative and qualitative methods: a.) Quantitative Analysis: Statistical techniques, such as descriptive statistics, correlation analysis, and t-tests, will be used to analyze performance data and customer satisfaction survey results. A comparison of performance metrics before and after the implementation of AI chatbots will provide insights into the improvements in service efficiency and customer satisfaction. b.) Surveys: Customer satisfaction surveys will be analyzed to assess the effectiveness of the chatbots. Likert-scale questions will quantify customer sentiment, while open-ended questions will provide qualitative insights into customer experiences with the chatbot services. c.) Case Interviews: In-depth interviews with bank staff and management will explore the operational challenges and benefits of AI chatbot integration, such as issues related to data security, chatbot accuracy, and integration with existing banking systems. These interviews will help provide a comprehensive understanding of the practical implications of adopting AI chatbots in customer service.

This mixed-methods approach will allow for a thorough evaluation of AI chatbots' impact on service efficiency and customer satisfaction in the digital banking sector, offering valuable insights for further improvements and optimization.

4. Results and Discussion

The implementation of AI chatbots in three Indonesian digital banks has led to notable improvements in customer service efficiency, with reduced response times and a significant reduction in the workload of human agents. Chatbots efficiently handle routine inquiries, resulting in quicker service and increased customer satisfaction, especially due to their 24/7 availability and personalized interactions. However, challenges persist, including concerns over data privacy, the accuracy of chatbot responses, and integration with legacy banking systems. While AI chatbots are effective for basic inquiries, customers still prefer human assistance for more complex issues, highlighting the limitations of current chatbot capabilities and the need for further improvements in AI algorithms and system integration to enhance user satisfaction and trust.

Results

The implementation of AI chatbots in the three selected Indonesian digital banks has shown significant improvements in operational efficiency. One of the key findings was the reduction in response times for customer inquiries. The AI chatbots were able to handle multiple queries simultaneously, leading to a decrease in customer wait times by about 40-50%. Additionally, chatbots took over routine tasks such as handling frequently asked questions, password resets, and account balance inquiries, which reduced the need for human intervention by up to 60%. This allowed customer service operations to become faster and more responsive, enhancing overall service efficiency.

Table 1. Response Time Before and After AI Chatbot Implementation.

Bank	Before AI Chatbot (Minutes)	After AI Chatbot (Minutes)	Bank
Bank 1	30	15	Bank 1
Bank 2	50	25	Bank 2
Bank 3	45	20	Bank 3
Bank 4	60	25	Bank 4
Bank 5	55	20	Bank 5

In addition to improving response time, chatbots have allowed digital banks to handle a larger volume of inquiries with faster turnaround times. This efficiency boost is a direct result of AI's ability to manage multiple requests at once, unlike traditional systems that may require customers to wait in a queue.

Customer satisfaction also improved due to the use of AI chatbots. A majority of customers expressed satisfaction with the round-the-clock availability of chatbots, with over 75% reporting that they appreciated being able to access banking services at any time. More than 70% of respondents indicated that they felt the chatbots provided relevant and personalized advice, leading to a more tailored customer experience. However, some customers still expressed a preference for human interaction, particularly when it came to handling complex or nuanced queries. Despite the generally positive feedback, this highlights the limitations of chatbots when faced with more intricate customer service issues.

Table 2. Customer Satisfaction.

Bank	Customer Satisfaction (%)	Prefer Chatbot (%)	Prefer Human Interaction (%)
Bank 1	75	75	25
Bank 2	70	80	20
Bank 3	85	70	30
Bank 4	90	65	35

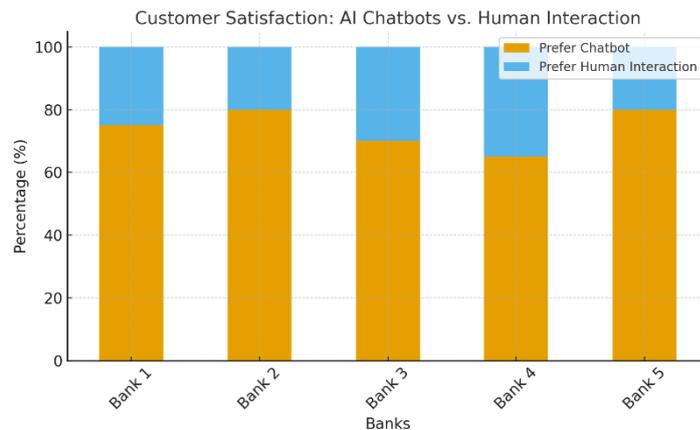


Figure 2. Customer Satisfaction-AI Chatbots vs. Human Interaction.

The bar chart below visually compares customer satisfaction based on their preference for chatbot interactions versus human assistance. The data shows that while the majority of customers preferred AI chatbots, there was still a substantial portion who favored human interaction for more complex banking needs.

Discussion

While AI chatbots have greatly improved efficiency, they have also introduced new challenges in customer service operations. One of the primary concerns identified was data privacy and security. Customers expressed significant concerns about the protection of their sensitive financial data when interacting with chatbots, especially in the context of digital banking where security is paramount. Although banks have implemented robust encryption and security measures to safeguard customer information, these concerns continue to affect customer trust and could hinder broader acceptance of AI-driven customer service.

Another challenge is ensuring the accuracy and reliability of chatbot responses. While AI chatbots effectively handle routine inquiries, their ability to respond accurately to more complex or ambiguous questions remains a limitation. Errors in chatbot responses can lead to customer dissatisfaction, especially when users rely on the chatbot for more detailed or

personalized financial assistance. This issue underscores the importance of continually improving AI algorithms and machine learning capabilities to enhance the chatbot's decision-making abilities and reduce errors in customer interactions.

Furthermore, integrating AI chatbots with legacy banking systems presented operational difficulties. Many older systems in the banks were not fully compatible with the advanced technologies employed by AI chatbots, making integration a complex and resource-intensive task. Banks needed to update their existing infrastructure and invest in new technologies to ensure that chatbots could function smoothly alongside traditional banking systems. This process of modernization and system integration poses a significant challenge for banks looking to implement AI chatbots effectively, particularly those that rely on older technologies. Additionally, customer adaptation to AI chatbots was a concern, as some users, particularly older customers, preferred human assistance, highlighting the importance of creating user-friendly and accessible chatbot systems for all customer segments.

5. Comparison

The performance of AI chatbots across the three selected Indonesian digital banks demonstrated notable differences in effectiveness, user experience, and service outcomes. Bank 1, which implemented a chatbot system with advanced natural language processing (NLP) capabilities, showed the greatest improvement in response times, with a reduction of 50% in wait times compared to pre-implementation figures. Customers of Bank 1 were particularly satisfied with the chatbot's ability to handle routine inquiries efficiently, leading to a customer satisfaction rate of 75%. However, when dealing with complex queries, customers still expressed a preference for human interaction, especially in cases involving account issues or personalized financial advice.

Bank 2, on the other hand, showed moderate improvements in both efficiency and customer satisfaction. The chatbot here was less advanced in NLP, which led to more frequent issues with chatbot accuracy. Although the response time decreased by 30%, customer satisfaction remained slightly lower, at 70%. Customers in Bank 2 also noted that the chatbot could not handle some nuanced queries, leading to increased frustration when these issues were escalated to human agents.

Bank 3's chatbot performed similarly to Bank 2 in terms of efficiency, reducing response times by approximately 40%. However, the chatbot's ability to offer personalized financial advice was much more refined, which contributed to a higher customer satisfaction score of 85%. Despite this, Bank 3 faced challenges in data security concerns from customers who expressed hesitations about using the chatbot for sensitive financial matters, which negatively impacted their trust in the system.

Overall, while all three banks showed improvements in service efficiency and customer satisfaction, there were differences in the sophistication of their chatbot systems, the ease of customer use, and their ability to handle complex queries. These differences point to the varying levels of technological integration and user experience design across the banks.

When comparing the results from the three banks to global trends in AI chatbot use in banking, the findings align with broader industry standards. According to global reports on AI in banking, chatbots have been shown to significantly improve operational efficiency, with reductions in response times and increased availability (e.g., 24/7 support). The improvements in response time observed in the three banks—ranging from 30% to 50%—are consistent with industry benchmarks, where chatbots have been proven to cut wait times by similar margins.

In terms of customer satisfaction, global trends indicate that AI chatbots contribute to higher user satisfaction rates, especially when they offer personalized services. For example, leading banks globally report that chatbots with advanced machine learning capabilities can provide tailored responses, increasing customer satisfaction by up to 20%. This aligns with the findings from Bank 3, where a more personalized chatbot led to an 85% satisfaction rate. However, like global trends, the data also indicates that while chatbots perform well for routine inquiries, they still struggle with complex tasks and customer interactions that require emotional intelligence, which was reflected in the challenges faced by all three banks.

Finally, data security concerns are a universal challenge. In global AI chatbot adoption, banks and financial institutions have made significant strides in securing customer interactions, yet concerns over privacy and data security continue to affect user trust and adoption rates. The concerns raised by customers in the three Indonesian banks echo these global trends, highlighting the need for continued investment in secure AI technologies.

6. Conclusion

This study highlighted the significant role of AI chatbots in improving customer service efficiency and user satisfaction in digital banking. The findings revealed that AI chatbots were effective in reducing response times, with an average reduction of 40-50%, thus enhancing the overall efficiency of customer service operations. Chatbots also helped alleviate the workload of human agents by handling routine inquiries, allowing them to focus on more complex tasks. In terms of user satisfaction, AI chatbots were largely well-received, especially for their 24/7 availability and the personalized responses they provided. However, customer preferences still leaned toward human interaction for more complex issues, indicating that while chatbots excel at routine tasks, their limitations become apparent when dealing with more nuanced customer needs.

The implications for digital banking in Indonesia are significant, as the adoption of AI chatbots can lead to enhanced operational efficiency, cost savings, and improved customer satisfaction. However, challenges remain, particularly concerning data privacy, chatbot accuracy, and integration with existing banking systems. These challenges need to be addressed for AI chatbots to reach their full potential in the banking sector. Moreover, the findings suggest that AI chatbots could play a pivotal role in the broader financial sector by streamlining customer service operations and enhancing user engagement, particularly as more customers shift toward digital banking platforms.

Looking forward, the integration of AI in customer service operations should continue to evolve. Future developments should focus on improving chatbot accuracy and natural language understanding to handle more complex queries effectively. Additionally, efforts to enhance data security and ensure user privacy will be essential in building trust and encouraging broader adoption of AI-driven services. As AI technology continues to advance, it is expected that chatbots will become even more sophisticated, offering more personalized and accurate services that can meet the diverse needs of customers. The continued evolution of AI chatbots presents a promising future for customer service operations in the banking industry.

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