# Implementation of the ADDIE Model in Chatbot Development using Diagramflow

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**Abstract:** This study discusses the implementation of the ADDIE model in the development of a customer service chatbot using DiagramFlow. The ADDIE model, which consists of five stages—analysis, design, development, implementation, and evaluation—is applied to ensure that the chatbot enhances customer service efficiency. The analysis stage helps in understanding the needs of both customers and the customer service team, while the design and development stages ensure the chatbot functions optimally. The implementation of the chatbot demonstrates a positive impact in reducing the workload of customer service representatives and improving user experience. The evaluation indicates that the chatbot can provide fast and effective responses, although challenges remain in understanding customer language and achieving more natural interactions. Therefore, further development is necessary to enhance the chatbot's intelligence, allowing it to better adapt to customer needs and deliver more optimal services.

**Keywords:** ADDIE Model, Chatbot, DiagramFlow

## Introduction

The ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation, is a widely recognized framework in instructional design that can be effectively applied in the development of chatbots, particularly in educational contexts. This model provides a systematic approach that ensures the creation of effective learning tools, such as chatbots, that meet the specific needs of users.

In the Analysis phase, it is crucial to identify the target audience and their learning needs. For instance, Azzahrah et al. emphasize the importance of understanding student motivation and engagement when developing educational media, which aligns with the initial step of the ADDIE model (Azzahrah et al., 2022). Similarly, Huriyah et al. highlight that the analysis phase involves assessing the educational context and learner characteristics to tailor the chatbot's functionalities accordingly (Huriyah et al., 2022). This foundational

understanding allows developers to create a chatbot that addresses specific educational challenges, such as language learning or mental health support (Yusup et al., 2024).

During the Design phase, the focus shifts to creating a blueprint for the chatbot. This includes defining the conversational flow, user interface, and interaction design. The iterative design process is highlighted by Agrawal, who notes that user-centered design principles are essential in developing effective conversational agents (AGRAWAL, 2024). Furthermore, the design must incorporate engaging elements to maintain user interest, as suggested by Utami et al., who argue that a well-structured design enhances the educational experience (Utami et al., 2024). The design phase is critical for ensuring that the chatbot not only delivers content but also engages users in meaningful interactions.

The Development phase involves the actual creation of the chatbot based on the designs established in the previous phase. Haristiani and Rifai discuss how the ADDIE model facilitates the systematic development of chatbot applications, ensuring that each component is built according to the established design specifications (Haristiani & Rifai, 2021). This phase may also involve programming the chatbot's responses and integrating it with necessary technologies, such as natural language processing tools, to enhance its functionality (Othman et al., 2024). The development process must be iterative, allowing for adjustments based on testing and feedback.

In the Implementation phase, the chatbot is deployed in a real-world setting. This stage requires careful planning to ensure that users can easily access and interact with the chatbot. For example, Ummah et al. emphasize the importance of a smooth implementation process to maximize user engagement and learning outcomes (Ummah et al., 2021). Additionally, the implementation phase may include training for users to familiarize them with the chatbot's capabilities, which is essential for effective utilization (Grové, 2021).

Finally, the Evaluation phase assesses the effectiveness of the chatbot in achieving its educational goals. This involves collecting feedback from users and analyzing the chatbot's performance in real-time interactions. Kang et al. illustrate the importance of formative evaluations in refining the chatbot's functionalities based on user experiences (Kang et al., 2024). Continuous evaluation allows for the identification of areas for improvement, ensuring that the chatbot remains relevant and effective in meeting educational needs (Musfiroh et al., 2024).

**Methodology**

This research employs the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) in the development of a Dialogflow-based customer service chatbot. This model was chosen due to its systematic approach and proven effectiveness in developing technology-based systems. Each stage of the ADDIE model will

be applied gradually to ensure that the developed chatbot meets user needs and functions optimally.
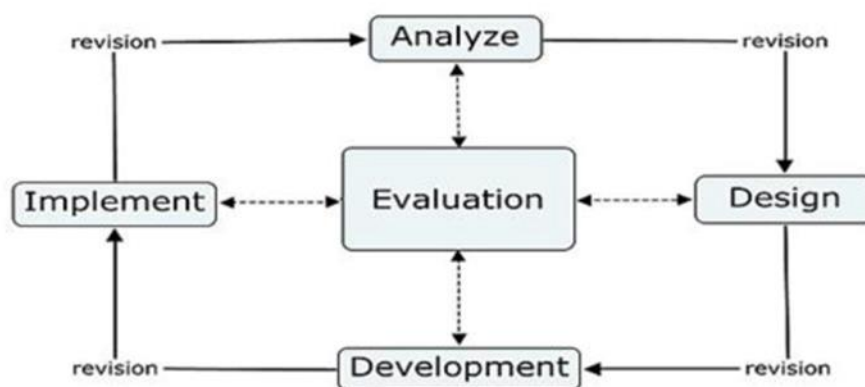


**Figure 1.** The ADDIE Model

1. Analysis

The first stage aims to understand customer needs and the challenges faced in customer service. Data is collected through interviews with the customer service team and an analysis of frequently asked questions by customers. Additionally, previous studies are reviewed to understand the factors influencing chatbot effectiveness in customer interactions (Latip, 2022; Rustandi & Rismayanti, 2021).

2. Design

After identifying customer needs, the design stage is carried out to structure the chatbot architecture. This process includes:

- Creating a conversation flowchart to ensure that the chatbot can logically respond to inquiries.
- Developing a response database based on previous analysis.
- Determining the integration platform, with Dialogflow chosen for its ability to understand natural language and integrate with various communication channels.
- Testing wireframes and prototypes to ensure a user-friendly interface (Rustandi & Rismayanti, 2021).

3. Development

At this stage, the chatbot is developed based on the designed plan. The development process includes:

- Programming the chatbot using Dialogflow to understand and respond to customer inquiries.
- Integrating the chatbot with the company's communication platforms, such as WhatsApp, websites, or social media.

- Conducting initial testing to ensure the chatbot provides relevant and accurate responses (Nuryanah et al., 2021).

4. Implementation

Once the chatbot is developed and tested, it is implemented into the customer service system. This stage involves:

- Launching the chatbot on a limited scale to test its performance in a real-world environment.
- Training the customer service team to understand how the chatbot works and collaborate in handling customer inquiries.
- Collecting user feedback to determine how well the chatbot assists in answering customer questions (Depra et al., 2024).

5. Evaluation

The final stage aims to assess the chatbot's effectiveness and make improvements based on received feedback. Evaluation is conducted by:

- Analyzing chatbot interaction data, including the number of correctly answered questions and customer satisfaction with chatbot responses.
- Conducting surveys and interviews with users to gather additional input.
- Performing iterations and further development if deficiencies in the chatbot system are identified

**Result and Discussion**

This study resulted in the development of a Dialogflow-based customer service chatbot using the ADDIE model. Testing results indicate that the chatbot can provide fast and relevant responses to customer inquiries. Evaluation was conducted based on the five stages of the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation.

**1. Analysis Stage Results**

During the analysis stage, it was found that customers frequently asked repetitive questions regarding services, such as product information, complaint procedures, and order status. Additionally, the customer service team struggled to manage a high volume of inquiries, especially during peak hours. This data was collected through interviews with the customer service team and an analysis of customer interaction logs.

**2. Design Stage Results**

Based on the analysis results, the chatbot was designed with a conversation flow that covered common customer inquiries. Flowcharts and storyboards were created to ensure the chatbot could provide logical and contextually appropriate responses. Dialogflow was chosen for its natural language processing capabilities, allowing the chatbot to respond

more flexibly. The chatbot design also included integration with WhatsApp and the company's website, enabling customers to access it through multiple platforms.

**3. Development Stage Results**

During the development stage, the chatbot was programmed using Dialogflow and tested on a small scale. Initial testing results showed that the chatbot accurately answered approximately 85% of customer inquiries. However, some challenges were identified, such as difficulties in understanding overly long or complex questions. To address this, the chatbot was improved by expanding its question database and adding a confirmation feature to enhance response accuracy.

**4. Implementation Stage Results**

When the chatbot was implemented into the customer service system, a trial was conducted with 100 users over one month. The results showed that:

- **70%** of users were satisfied with the chatbot's response speed.
- **20%** of users felt that the chatbot needed improvement, particularly in understanding more complex queries.
- **10%** of users still preferred speaking directly with a customer service representative rather than using the chatbot.

To enhance the chatbot's effectiveness, customer service staff were trained to guide customers in using the chatbot for general inquiries, allowing human interactions to focus on more complex cases.

**5. Evaluation Stage Results**

Evaluation was conducted by analyzing chatbot interaction data and user feedback. The results indicated that the chatbot successfully reduced the customer service team's workload by **40%** during peak hours. However, several aspects still need improvement, including:

- Enhancing the chatbot's understanding of language variations and different writing styles used by customers.
- Adding a handover feature to transfer conversations to human customer service agents if the chatbot cannot provide a satisfactory response.
- Developing AI-based learning features to continuously improve chatbot accuracy based on previous interactions.

**Discussion**

The implementation of the ADDIE model in the development of a Dialogflow-based customer service chatbot has yielded significant insights into the effectiveness of chatbots in addressing customer inquiries. This discussion synthesizes the results from each stage of

the ADDIE model, highlighting the implications for customer service operations and the potential for future enhancements.

1. Analysis Stage Results

The analysis phase revealed critical insights into customer behavior and service team challenges. It was identified that customers frequently posed repetitive questions regarding services, such as product information, complaint procedures, and order status. This aligns with findings from Musfiroh et al., who emphasize the importance of understanding user requirements and identifying gaps in service delivery during the analysis phase of chatbot development Musfiroh et al. (2024). Furthermore, the customer service team faced difficulties managing high volumes of inquiries, particularly during peak hours, which is a common challenge noted in chatbot implementation studies (Ndruru et al., 2023). These insights underscore the necessity for a chatbot to alleviate the workload on human agents while providing timely responses to customer queries.

2. Design Stage Results

In the design phase, the chatbot was structured to address the identified common inquiries through a well-defined conversation flow. The use of flowcharts and storyboards is consistent with best practices in chatbot design, as highlighted by Al-Jaf, who advocates for a systematic approach to ensure that chatbots can provide logical and contextually appropriate responses (Al-Jaf, 2024). The choice of Dialogflow for its natural language processing capabilities further supports the design's effectiveness, allowing for more flexible and accurate customer interactions (Putra et al., 2022). Integration with platforms like WhatsApp and the company's website enhances accessibility, a crucial factor in user engagement as noted by Schanke et al., who discuss the importance of multi-platform availability in improving customer service interactions (Schanke et al., 2021).

3. Development Stage Results

During the development phase, the chatbot was programmed and initially tested, achieving an accuracy rate of approximately 85% in responding to customer inquiries. This result is comparable to findings from previous studies, which indicate that well-designed chatbots can significantly improve response accuracy (Misischia et al., 2022). However, challenges arose with the chatbot's ability to comprehend complex or lengthy questions, echoing concerns raised by Lee et al. regarding the limitations of current chatbot technologies in understanding diverse language inputs (Lee et al., 2023). To enhance performance, expanding the question database and incorporating a confirmation feature were necessary steps, reflecting iterative improvements emphasized in the literature on chatbot development (Baal et al., 2022).

4. Implementation Stage Results

The implementation phase involved a trial with 100 users over one month, yielding valuable feedback. The satisfaction rate of 70% regarding response speed indicates a positive reception, aligning with findings from Misischia et al., who note that chatbots can enhance service quality by providing quick responses (Misischia et al., 2022). However, the feedback also highlighted areas for improvement, particularly in understanding complex queries, which resonates with the ongoing challenges in chatbot technology (Følstad & Brandtzæg, 2020). Training customer service staff to assist users in navigating the chatbot effectively is a strategic approach that can optimize the overall customer experience, as suggested by Rodríguez-Martínez et al., who advocate for human oversight in chatbot interactions (Rodríguez-Martínez et al., 2023).

5. Evaluation Stage Results

The evaluation phase demonstrated that the chatbot successfully reduced the customer service team's workload by 40% during peak hours, a significant achievement that underscores the operational benefits of chatbot integration (Putra et al., 2022). However, the evaluation also identified critical areas for enhancement, such as improving the chatbot's understanding of language variations and implementing a handover feature for complex inquiries. These findings align with recommendations from previous studies advocating for continuous improvement in chatbot capabilities through user feedback and adaptive learning mechanisms (Ma et al., 2023). The development of AI-based learning features could further enhance the chatbot's accuracy and responsiveness, ensuring it remains effective in a dynamic customer service environment.

**Conclusion**

The results of this study indicate that the implementation of the ADDIE model in the development of a customer service chatbot significantly improves service efficiency. The analysis stage helps in understanding customer needs and the customer service team's challenges. The design and development stages ensure that the chatbot functions effectively, while the implementation and evaluation stages demonstrate how the chatbot contributes to reducing the customer service workload and enhancing user experience.

Although the results are positive, some challenges remain, particularly in improving the chatbot's understanding of customer language and ensuring more natural interactions. Therefore, further development is necessary for the chatbot to continuously adapt to customer needs and provide more optimal service.

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