

Smart Chatbot as a Learning Media for Al-Islam and Kemuhammadiyah Values Based on WhatsApp

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Abstract

Chatbots represent a form of interactive digital media capable of delivering real-time responses to user inputs. This article explores the development of an intelligent chatbot designed to facilitate the learning of Islamic values and the principles of Muhammadiyah through the WhatsApp platform. The primary objective of the study is to design an AI-powered chatbot that can interactively respond to inquiries and disseminate information related to Islamic teachings and the Muhammadiyah movement. Employing a prototyping research methodology, the study follows iterative phases including data collection, analysis, system design, implementation, and testing. This approach enables the chatbot to accurately interpret and respond to user queries within a predefined thematic framework, specifically focused on religious content. The integration of the chatbot into WhatsApp, a widely used social messaging application, allows for enhanced accessibility and engagement, particularly among younger users. Through this platform, the chatbot functions as an innovative educational tool aimed at fostering deeper religious understanding in a format aligned with the communication preferences of the millennial generation. The study concludes that the implementation of an AI-based chatbot in religious education presents promising opportunities for contextualized learning, interactivity, and the reinforcement of religious values in a digitally connected society. Future research is encouraged to expand its capabilities, explore user satisfaction, and assess its long-term impact on religious knowledge acquisition and behavioral change.

Introduction

In the contemporary digital era, social media platforms have become an indispensable part of daily communication, especially among millennials and Generation Z. Among the various applications, WhatsApp has emerged as one of the most popular instant messaging services, facilitating rapid and seamless communication that transcends spatial and temporal boundaries. Its widespread adoption among Indonesian youth highlights the app's potential not only as a tool for personal communication but also as a medium for education and value formation. Despite its popularity, the educational and moral content disseminated via WhatsApp and other social media platforms remains limited, often overshadowed by entertainment and misinformation.

In parallel with these digital trends, recent advancements in Artificial Intelligence (AI) have introduced new possibilities in human-computer interaction, one of which is the development of chatbots. These AI-driven conversational agents are capable of simulating human dialogue with increasing sophistication. Chatbots have been integrated into various domains, including customer service, digital assistance, and more recently, education. Through natural language processing and machine learning, chatbots are now able to understand user input and provide context-relevant responses, offering interactive and adaptive learning experiences.

In the context of religious education, particularly Islamic studies, the integration of technology presents both opportunities and challenges. Islam emphasizes the inculcation of core moral values such as piety, honesty, and justice. These values form the foundation of a spiritually

fulfilling life and are integral to the development of a just society. The Muhammadiyah movement, one of the largest Islamic organizations in Indonesia, further promotes rational, inclusive, and environmentally conscious interpretations of Islamic teachings. Its educational and dakwah (Islamic propagation) activities aim to modernize religious understanding while preserving the spiritual essence of Islam.

Despite the efforts of Islamic institutions, there remains a significant gap in effectively transmitting religious values to the younger generation, particularly those raised in a digital environment. Millennials and Gen Z are digital natives who often engage in virtual interactions more than face-to-face communication. Traditional methods of religious instruction, often confined to formal classrooms or sermon-style lectures, may not resonate with their learning preferences or lifestyle. Therefore, innovative strategies are required to bridge this disconnect, one of which is the utilization of social media platforms for religious education.

WhatsApp, with its widespread penetration and ease of use, holds immense potential as a vehicle for religious learning. A 2022 survey revealed that 92.1% of Indonesian internet users aged 16 to 64 were active WhatsApp users throughout the year (Hasya, 2023). Moreover, adolescents constitute the largest demographic of internet users in Indonesia, with internet penetration among individuals aged 13–18 reaching 99.16% between 2021 and 2022 (Dimas, 2022). These figures align with the demographic structure of the country, where the 2020 National Census reported that 61% of the population was under the age of 35 (BPS, 2021). This youthful demographic presents both a challenge and an opportunity for religious education.

The primary challenge lies in the relatively low level of religious literacy among Indonesian youth. According to a 2021 study by the Center for Islamic and Social Studies (PPIM) at UIN Syarif Hidayatullah Jakarta, 54.36% of respondents from the millennial and Gen Z groups exhibited a lack of deep understanding of religious teachings (PPIM, 2021). Furthermore, the National Research and Development Center for Religious Education (Balitbangdiklat) reported that many Indonesians have yet to internalize and consistently practice religious values (Balitbangdiklat.kemenag.go.id, 2010). These findings underscore the necessity of exploring new pedagogical approaches that align with the digital behavior of today's youth.

Although several studies have explored the use of social media in education, few have specifically examined its application in teaching religious and moral values. Research by Achmad Jalilul Chakam et al. (2023) and Parina et al. (2022) discuss social media as a learning medium but fall short of focusing on religious education. Likewise, studies concentrating on religious instruction have not adequately considered the role of WhatsApp, despite its immense popularity among teenagers (Riadil et al., 2020; Siregar, 2020). Other investigations have delved into the factors influencing youth interest in religious learning but lack practical models tailored to the digital characteristics of younger generations (Munawaroh & Pavytha, 2023; Nudin, 2020; Ummah, 2020). Additionally, limited attention has been given to how religious organizations such as Muhammadiyah can leverage technology in their dakwah activities (Ghozali & Haqq, 2018).

These gaps in the literature point to a compelling need for the development of a chatbot-based educational system that integrates Islamic and Muhammadiyah values, specifically designed for deployment through WhatsApp. Such an initiative could combine AI technology with religious pedagogy to create an interactive, personalized, and scalable educational tool. This would not only address the existing limitations of traditional religious education but also meet the communication preferences of digitally native users.

This research, therefore, seeks to design and develop an AI-based chatbot capable of responding to questions and delivering educational content on Islamic values and Muhammadiyah teachings through WhatsApp. By embedding the chatbot into a familiar and frequently used platform, the project aims to create a more accessible and engaging learning environment. The chatbot will serve as a digital companion, offering accurate and context-appropriate responses, and encouraging reflective dialogue on ethical and spiritual matters. This approach aligns with the educational objectives of Islamic teachings, which emphasize continual learning (*talabul 'ilm*), introspection (*muhasabah*), and moral development (*akhlaq*).

The study adopts a prototyping methodology to iteratively develop the chatbot, incorporating user feedback and performance testing to enhance its usability and educational effectiveness. Through this method, the research aims to ensure that the chatbot delivers reliable content, engages users meaningfully, and supports the intended learning outcomes. The chatbot's knowledge base will be structured around core themes of al-Islam and Kemuhammadiyah, including theology (aqidah), worship (ibadah), ethics (akhlaq), and Muhammadiyah's historical and ideological foundations. The integration of these elements will provide users with a comprehensive yet concise reference that can be accessed anytime and anywhere.

In doing so, the research also contributes to the broader discourse on digital religious pedagogy and AI ethics. It raises important questions about how technology can be harnessed to promote spiritual growth without compromising the depth and authenticity of religious teachings. Furthermore, it addresses concerns regarding the credibility of digital religious content, which is often susceptible to misinformation and misinterpretation. By anchoring the chatbot's responses in authenticated sources and aligning its development with Islamic values, the study aims to ensure both educational quality and theological integrity.

Ultimately, this research aspires to bridge the gap between technological innovation and religious education. It proposes a practical solution to engage young Muslims in meaningful learning experiences that foster both intellectual and spiritual growth. By leveraging the ubiquity of WhatsApp and the power of AI, the chatbot serves as a modern tool for the timeless mission of da'wah and tarbiyah (education). It not only supports the digital transformation of Islamic education but also aligns with Muhammadiyah's vision of progressive Islam that is rational, ethical, and responsive to the challenges of modernity.

Literature Review and Hypotheses Development

2. Theoretical Framework

2.1 Technological Advancements and Societal Transformation

Technological innovation has increasingly become embedded in every aspect of modern life, influencing everything from basic human needs to social interaction and personal fulfillment. As society progresses through successive eras—from agriculture and industry to the information age and now the digital learning age—technology continues to redefine the ways in which individuals access, process, and engage with information (Danuri, 2019; Raihan et al., 2022). In this context, mobile technology, particularly smartphones, has emerged as a primary tool enabling widespread and seamless access to information. Among the most utilized applications on these devices is the instant messaging service WhatsApp, which serves not only as a platform for interpersonal communication but also as a potential medium for educational engagement.

2.2 Artificial Intelligence in Digital Interaction

Artificial Intelligence (AI) represents a branch of computer science dedicated to the development of systems capable of performing tasks that traditionally require human intelligence. These tasks include reasoning, learning, problem-solving, perception, and language understanding (Syamsuddin, 2019). Historically, computers were used merely for mathematical calculations, but the evolution of computing has extended their functionality into realms previously dominated by human cognition (Bardi & Jailani, 2015; Tubagus, n.d.).

AI systems are designed to emulate human learning by integrating knowledge and experience into decision-making frameworks. The greater the volume and diversity of data an AI system processes, the more refined its ability becomes in addressing complex problems. This principle underpins AI development in various domains, from healthcare and finance to education and customer service. In educational technology, AI offers the possibility of creating personalized, responsive learning experiences that can support diverse learner needs and preferences (Sobron & Lubis, 2021).

2.3 The Role of Chatbots in Human-Machine Interaction

A chatbot is a software application designed to simulate human-like conversation using natural language processing (NLP). The concept dates back to the 1960s with early systems like ELIZA, which were developed to test the boundaries of human-computer interaction by mimicking human dialogue (Benedictus et al., 2017; Yusuf et al., 2022). In contemporary contexts, chatbots serve a wide array of functions, from customer service to health diagnostics and educational assistance.

Modern chatbots are typically rule-based or AI-driven, allowing them to respond to user inquiries, provide relevant information, and even guide users through complex processes. As an educational tool, a chatbot can function as an intelligent tutor, answering questions, offering feedback, and guiding students through content in real time. Unlike static resources such as FAQs, chatbots provide dynamic, conversational support tailored to individual learners' needs (M. Wijaya et al., 2017). Recent research highlights the growing use of chatbots in marketing and education, emphasizing their capacity to engage users in meaningful, interactive dialogues (Gunawan et al., 2023).

2.4 WhatsApp as a Digital Learning Platform

WhatsApp is a widely used messaging application that facilitates the exchange of text, images, videos, documents, and voice messages over the internet. It also supports voice and video calls, enhancing its appeal as a cost-effective communication tool across distances (Halimatul Mu'minah & Sugandi, 2021). Its design leverages users' existing phone numbers for identification, making integration with mobile contacts seamless and intuitive.

Beyond its basic functionalities, WhatsApp includes features such as group chats, status updates, and location sharing, which increase its utility and social connectivity. With its simple interface and extensive global user base, WhatsApp has become a staple in both personal and professional communication. In educational contexts, WhatsApp has been employed as an informal learning environment, allowing for real-time interaction, collaboration, and resource sharing among students and educators.

Its prevalence among youth and student populations makes WhatsApp an ideal platform for delivering educational content in ways that align with users' daily communication habits. Particularly in religious education, which often struggles to engage younger audiences, leveraging WhatsApp can enhance accessibility, personalization, and interactivity.

2.5 Interactive Learning Media: Concept and Application

Interactive learning media are tools that combine software and hardware to present instructional content while enabling user engagement through responsive interfaces. These media support a two-way flow of information, allowing learners to input data and receive immediate feedback, thereby fostering active learning and deeper cognitive processing (Arifannisa & Yuliansih M, 2023; Hidayat, 2017).

Examples of interactive learning tools include simulations, quizzes, educational games, and, more recently, AI-based systems such as chatbots. The key advantage of interactive media lies in its ability to accommodate different learning styles and preferences. By engaging multiple senses and providing instant feedback, interactive media help learners to better retain and apply knowledge. In religious education, such tools can make abstract concepts more tangible and relatable, particularly for younger generations who are accustomed to digital environments.

Moreover, interactive learning is consistent with constructivist pedagogical theories, which posit that learners construct knowledge more effectively through active engagement rather than passive reception. In this light, the use of a chatbot on a platform like WhatsApp presents an opportunity to transform the delivery of Islamic and Muhammadiyah values from static to dynamic and dialogic.

2.6 Religious and Moral Education for the Millennial Generation

Islamic education emphasizes the internalization of core values such as faith, honesty, justice, and environmental stewardship. Muhammadiyah, as a major Islamic movement in Indonesia, has been instrumental in promoting rational, progressive interpretations of Islam. However, despite these efforts, recent surveys and studies indicate a significant gap in religious understanding and practice among Indonesian youth (Pusat Pengkajian Islam & Masyarakat UIN Jakarta, 2021; Balitbangdiklat.kemenag.go.id, 2010).

With the majority of Indonesia's population under the age of 35 (BPS, 2021), and digital media consumption among teenagers nearing 99% (Dimas, 2022), traditional religious teaching methods face the risk of obsolescence. There is an urgent need to align educational delivery with the technological preferences of the digital-native generation. A well-designed educational chatbot can bridge this gap by offering interactive, context-relevant learning experiences that reinforce Islamic teachings in accessible ways.

Although previous research has addressed the potential of digital media in education, few studies have specifically examined the use of social messaging platforms like WhatsApp for religious instruction (Achmad Jalilul Chakam et al., 2023; Parina et al., 2022). Even fewer have explored the integration of AI-powered tools such as chatbots in the dissemination of Islamic values or considered the institutional role of religious organizations in embracing these technologies (Ghozali & Haqq, 2018).

2.7 Integrating AI Chatbots into Islamic Education: A Conceptual Proposal

Given the theoretical underpinnings discussed above, this research supports the development and implementation of an AI-based chatbot designed to deliver Islamic and Muhammadiyah teachings via WhatsApp. Such a tool offers several pedagogical and practical advantages:

- **Accessibility:** Users can access the chatbot anytime and anywhere using their existing WhatsApp accounts.
- **Interactivity:** Real-time question-and-answer functionality allows for adaptive, user-driven learning.
- **Engagement:** The conversational format mimics human interaction, enhancing user involvement and retention.
- **Scalability:** Once deployed, the chatbot can serve a large number of users without diminishing quality.

This initiative not only aligns with the educational imperatives of the 21st century but also reflects the broader digital transformation agenda within Islamic institutions. By harnessing AI and leveraging widely adopted platforms, religious education can become more inclusive, effective, and future-ready.

Research Methods

3.1 Research Design

This research method is divided into several stages with the prototyping model application development approach as follows:

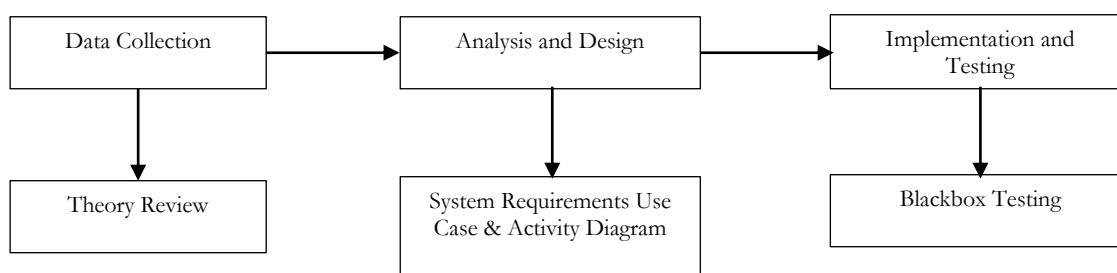


Figure 3.1. Research Method

3.2. Data Collection

The data used in this study were obtained through observational methods and a review of relevant literature. Observations were conducted during learning sessions that focused on the subjects of Al-Islam and Kemuhammadiyah, which are central to Islamic values and the Muhammadiyah movement. These observations aimed to identify existing gaps in learners' understanding, preferred modes of interaction, and the accessibility of religious knowledge among the millennial and Gen Z generations.

In parallel, a comprehensive literature review was conducted to support the design of the intelligent chatbot, particularly from prior studies on Islamic education, artificial intelligence in education, and the role of digital platforms in religious instruction. This dual approach ensured that both empirical insight and theoretical grounding informed the development process.

3.3. Analysis and Design

The next phase involved both functional analysis and application design based on the observational data and findings from the literature review. In particular, the analysis focused on identifying the necessary features that should be embedded into the chatbot system to support Islamic and Muhammadiyah education via WhatsApp.

a. Functional Analysis

This stage involved identifying the functional requirements for the intelligent chatbot. The features proposed are directly aligned with the needs of learners as identified during the initial data collection phase. These core functionalities are intended to serve as primary touchpoints between users and the chatbot, enhancing both educational value and user engagement. The features include:

Islamic Legal Consultation: Providing basic guidance based on Islamic jurisprudence (fiqh), tailored for everyday scenarios.

- **Worship Guidelines:** Offering step-by-step explanations for performing Islamic rituals such as prayer (shalat), fasting (shaum), and pilgrimage (hajj).
- **Faith and Theology Q&A:** Addressing common questions related to aqidah (Islamic creed) in a concise and accessible manner.
- **History of Muhammadiyah:** Presenting important milestones, figures, and doctrinal principles of the Muhammadiyah movement.
- **Events and Activities:** Informing users about Muhammadiyah's contemporary programs, conferences, and community service initiatives.
- **Daily Prayers and Supplications:** Offering a curated collection of du'a and dzikr for daily spiritual practice.

These features are designed to not only meet users' spiritual and intellectual needs but also to foster continuous engagement through conversational interaction.

b. Design Phase

In the design stage, the system architecture and navigation structure of the application were formulated. The primary platform for implementation is WhatsApp, leveraging its high adoption rate among Indonesian youth and its compatibility with chatbot integration.

The design process follows the UML (Unified Modeling Language) methodology, which provides a standardized blueprint for software structure and functionality. UML diagrams—such as use case diagrams, activity diagrams, and sequence diagrams—were developed to model the interaction between users and the chatbot system. These visual representations support the development of a well-organized, modular, and scalable application.

The navigational structure plays a pivotal role in ensuring that users can access the desired features with minimal cognitive load. A menu-based interface is proposed, where each main feature is represented as a selectable option in the chat. Users can interact with the bot by typing keywords or selecting predefined commands, enabling intuitive and efficient navigation through the content.

Additionally, the system design incorporates a feedback mechanism that logs common questions and user interactions, which can be used to train the AI model for more accurate and context-sensitive responses in future iterations.

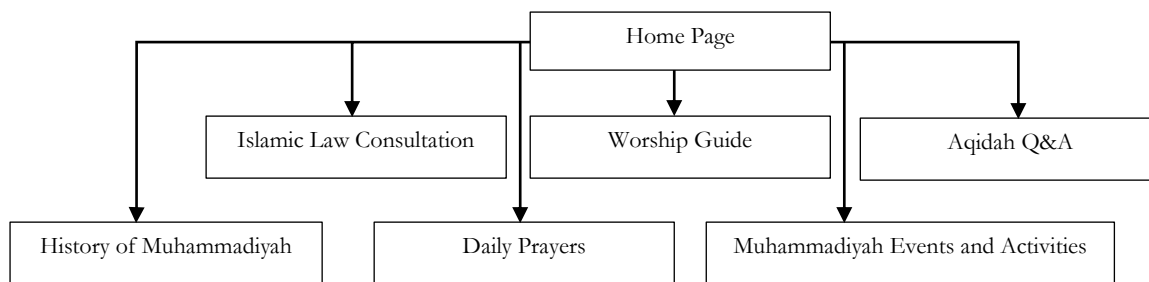


Figure 3.2. Chatbot Navigation Structure

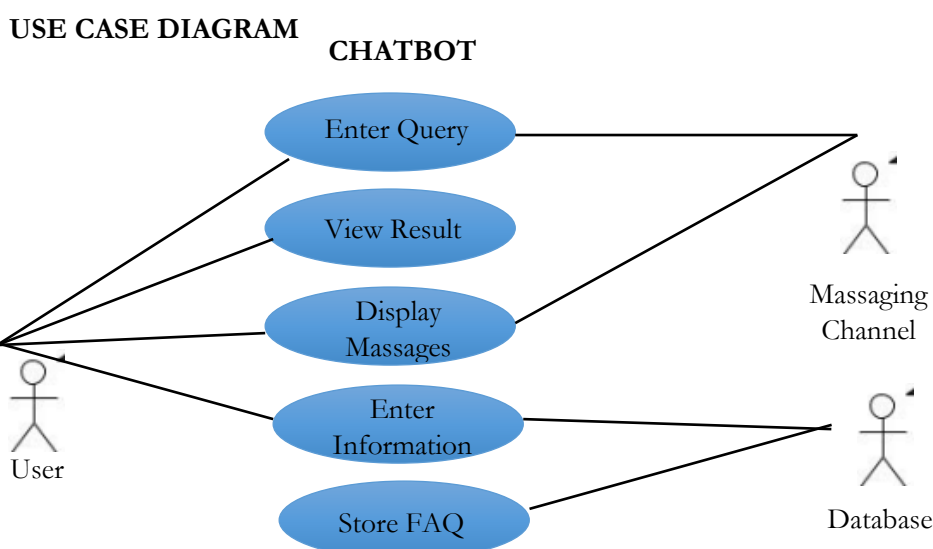


Figure 3.3. Use Case Diagram of Chatbot Application

3.4. Activity Diagram

Figure 4 illustrates the activity diagram representing the interaction flow between the user and the chatbot system. The process begins when the user initiates a query by inputting a message—either in the form of a question or specific information. This input is immediately processed and stored within a temporary database to facilitate system responsiveness and future learning.

Subsequently, the input is analyzed by the chatbot engine to determine whether the query falls within the predefined scope of the application, which includes topics related to Al-Islam and Kemuhammadiyah. This decision-making stage leads to two possible outcomes:

- **In-Scope Queries:** If the user's query is recognized as being within the scope, the system employs intent recognition and entity extraction mechanisms—common functions in Natural Language Processing (NLP)—to accurately interpret and generate a suitable response. These mechanisms rely on predefined datasets and rule-based algorithms tailored to Islamic educational content.
- **Out-of-Scope Queries:** If the chatbot identifies the input as outside its domain, it leverages more advanced NLP techniques, such as machine learning models and cognitive services, to generate a new response. These technologies enable the system to interpret and address user queries even if they were not initially anticipated during development.
- The newly generated responses—particularly for out-of-scope queries—are then logged into the system database, expanding the chatbot's knowledge base for future reference and improving its performance over time through continuous learning.

- Finally, the system returns a response to the user in a clear and structured format via the WhatsApp interface, completing the interaction loop. This process is designed to be efficient, context-aware, and adaptable to evolving user needs.

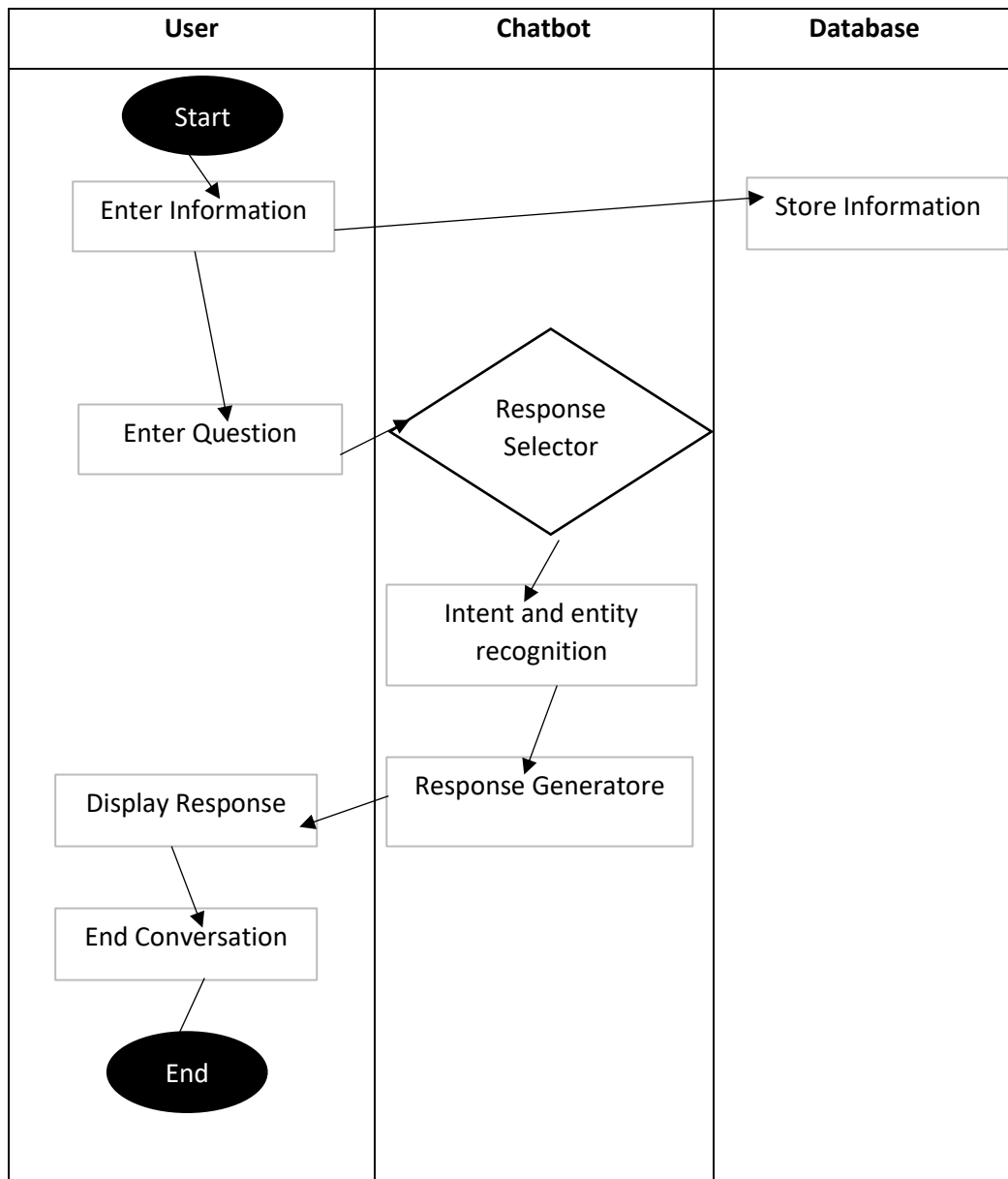


Figure 3.4. Activity Diagram of Chatbot Application

Results and Discussion

Implementation and Testing Discussion

The implementation of the AI chatbot was carried out through integration with the WhatsApp platform, utilizing the WhatsApp Business API and Autoresponder application. During the implementation phase, the AI chatbot was developed and deployed through several key stages to ensure optimal performance in delivering content related to Islamic values and the Muhammadiyah movement.

Development of Chatbot Architecture and Algorithm

The initial step in implementing the AI chatbot involved the design of its architecture and underlying algorithm. The chatbot employed Natural Language Processing (NLP) techniques to interpret user-generated messages (Wijanarko & Afrianto, 2020). The algorithm leveraged pattern matching and retrieval mechanisms from a pre-established knowledge base. The chatbot's

architecture was structured around several critical components (Fisryansah et al., 2024; Zakariya et al., 2024):

- Natural Language Understanding (NLU): This component interprets user input by identifying intent, entities, and contextual elements.
- Dialogue Manager: Responsible for managing the flow of conversation, deciding on actions, and generating appropriate responses.
- Natural Language Generation (NLG): Produces human-readable responses to deliver back to the user.
- Data Integration Layer: Connects the chatbot to external data sources and knowledge repositories to retrieve relevant information.

The algorithm was tailored to respond to queries concerning Islamic teachings and Muhammadiyah principles. The general flow of the chatbot's algorithm included the following steps:

- Receiving incoming messages via WhatsApp.
- Analyzing the message using NLU to extract intent and context.
- Searching the knowledge base using pattern-matching algorithms.
- Selecting the most contextually appropriate response.
- Generating responses in natural language or multimedia form using NLG.
- Sending responses back to the user through WhatsApp.

Additionally, the chatbot was programmed to request clarification or additional information when necessary, thereby enhancing user engagement and interactivity (Arifiyanti et al., 2023).

Integration with the WhatsApp Business API

Following the development of the chatbot's core functionality, the next phase involved integrating it with the WhatsApp Business API. This process entailed several steps (Fibriasari et al., 2022):

- Webhook Configuration: The chatbot was registered with the API and connected through webhooks that facilitated the flow of incoming user messages for processing.
- Authentication: Secure integration required authentication through tokens or credentials provided by the API provider.
- Automatic Response Configuration: The chatbot was configured to automatically send relevant responses in various formats including text, images, videos, and other multimedia content.

This integration allowed for seamless communication between users and the AI chatbot via the WhatsApp platform.

Knowledge Base Population

To ensure the delivery of accurate and contextually appropriate content, the chatbot required a well-structured knowledge base. The content was curated based on standardized curricula and instructional materials on Islam and Muhammadiyah, covering topics such as:

- The historical background of Islam and the Muhammadiyah movement
- Core Islamic doctrines and principles
- Muhammadiyah values and teachings
- Contributions of Muhammadiyah to society
- Contemporary issues in Islamic discourse
- Religious rituals and practices
- Islamic perspectives on socio-economic and cultural issues
- Biographies and teachings of key Islamic and Muhammadiyah figures
- Islamic legal consultations

- Worship guidelines
- Muhammadiyah events and activities
- Daily supplications (du'as)

This knowledge base was structured for efficient retrieval by the chatbot's algorithm to deliver accurate responses.

Functional and Performance Testing

After implementation, a series of tests were conducted to evaluate the chatbot's performance and ensure it met functional requirements. The testing phase included the following evaluations:

- **Natural Language Understanding Test:** The chatbot was subjected to various conversational scenarios to assess its ability to accurately interpret natural language inputs (M. H. Wijaya et al., 2018).
- **Information Accuracy Test:** Responses were evaluated against the curated content to verify that the chatbot provided correct and relevant information (Cannavaro, 2023).
- **Response Time Test:** The speed of response was measured to identify latency issues and optimize system performance (Saputri & Prasetyawati, 2024).
- **Complex Dialogue Handling Test:** The chatbot's ability to manage multifaceted conversations, including topic shifts and clarification requests, was tested (Abdurrohman, 2024).
- **Interface and Interaction Test:** This involved assessing how well the chatbot presented information in various formats and the overall user experience during interaction (Abdurrohman, 2024).

The results of these tests were used to pinpoint areas for improvement and ensure a robust performance prior to full-scale deployment.

Evaluation and Refinement

Post-testing, an in-depth evaluation was conducted to identify deficiencies and opportunities for enhancement (Tri Toto Wiharjianto et al., 2024). This involved reviewing the following aspects:

- **Accuracy of Language Understanding:** Evaluating how effectively the chatbot interpreted intents, entities, and contextual information.
- **Information Precision:** Ensuring the factual accuracy of responses concerning Islamic and Muhammadiyah-related content.
- **Response Speed:** Assessing and optimizing the time taken to deliver responses.
- **Handling Complex Conversations:** Reviewing the chatbot's adaptability to dynamic conversational flows.
- **User Interface Quality:** Analyzing the usability and clarity of the chatbot interface.
- **User Feedback:** Gathering insights from user interactions for system refinement.

Based on the evaluation outcomes, the development team implemented several refinements:

- Enhancing the NLU algorithm for improved language comprehension.
- Expanding and updating the knowledge base to ensure relevance and accuracy.
- Optimizing conversation flow logic to improve user interaction.
- Accelerating computational processes to minimize response delays.
- Improving the interface to enhance accessibility and user experience.

These iterative refinements were vital in ensuring that the AI chatbot could deliver informative, accurate, and engaging content to users learning about Islamic and Muhammadiyah values via the WhatsApp platform.

Implication and Conclusion

This article discusses the development of an intelligent chatbot designed for learning Islamic values and Muhammadiyah principles through the WhatsApp platform. The aim of this research is to design an AI-based chatbot capable of answering questions and providing information regarding Islam and the Muhammadiyah movement in an interactive manner. The research method employed is the prototyping model, which includes data collection, analysis, design, implementation, and testing phases for the chatbot. Through this approach, the chatbot is able to respond accurately to user inputs, such as queries or information related to Islam and Muhammadiyah, within the defined scope. The chatbot is expected to enhance the understanding of religious values, particularly for the millennial generation, through the social media platform WhatsApp.

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