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# The Implementation of an Artificial Intelligence-Based Virtual Assistant Chatbot for Academic Information Services

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**Abstract**

*The academic information services at the Faculty of Engineering, Hamzanwadi University currently still rely on manual methods that require considerable time and effort, especially in answering repetitive questions. Therefore, this study proposes the use of an artificial intelligence-based chatbot to provide academic information automatically through the WhatsApp platform. This chatbot system is built using the n8n platform for workflow automation and Gemini AI for natural language processing (NLP), enabling it to understand and provide relevant answers to students' questions. In this study, the system was tested through a series of trials to evaluate the effectiveness of the chatbot in delivering academic information services, such as academic schedules, course registration (KRS), and other related information. The results showed that the implementation of this chatbot can improve the efficiency of academic services by providing fast and accurate responses, as well as reducing the workload of administrative staff.*

***Keywords****: academic services, artificial intelligence, automated Service Systems, chat bot, NLP*

## INTRODUCTION

As an integral part of the higher education system, the quality of academic services plays a very important role in supporting students success in achieving their academic goals (Sudianto et al., 2023). The Faculty of Engineering at Universitas Hamzanwadi provides academic services, which are an important component of higher education management . These services consist of various activities that support the smooth implementation of students academic processes (Harianto et al., 2024). Academic services also play a strategic role in increasing student satisfaction with educational institutions, which in turn creates a positive learning experience. However, in practice, there are challenges related to efficiency and response speed in the academic information service process at the Faculty of Engineering. Students often have to come directly to campus to obtain information that should be independently accessible, such as information regarding the procedure for filling out the Study Plan Card (KRS), class schedules, requirements and procedures for applying for academic leave, as well as information about tuition fee payments and re-registration. This is caused by the limited number of administrative staff, restricted service hours, and the high volume of repetitive questions that must be answered repeatedly, which slows down administrative processes and increases staff workload.

The development of information technology, particularly artificial intelligence (AI), provides opportunities to address this issue through the implementation of chatbots or virtual assistants (Belda-Medina & Kokošková, 2023). This technology enables computers to perform tasks that were previously only possible for humans, such as providing information and guiding users through services automatically and intelligently (Labadze et al., 2023). A chatbot is a computer application designed to simulate conversation or interactive communication with users (humans) through text, voice, or visual media. Chatbots or virtual assistants use Natural Language Processing (Natural Language Processing/NLP) to understand user questions and provide contextual and easily understandable responses. In the context of higher education, virtual assistants can be used to provide various academic services, such as information on the procedure for filling out the Study Plan Card (KRS), requirements for applying for academic leave, and schedules for tuition payments and re-registration. The use of virtual assistants can improve service efficiency, accelerate responses to student inquiries, and reduce the workload of administrative staff. Another advantage is that virtual assistants can operate 24 hours a day, allowing students to access information anytime without time or location limitations.

## LITERATURE REVIEW

### 2.1. Related Studies

A related study by Artificial Intelligence in Education examined the role of AI chatbots in education through a narrative review, showing that chatbots can support learning activities, provide instant feedback, and assist educators in academic tasks, while also raising concerns about privacy and academic integrity (Davar et al., 2025) . Another study developed an AI-based chatbot as a student support system at National Open University of Nigeria to address delayed responses in academic e-ticketing services. The system was built using Python, ChatterBot, SQLite, and Flask, and the results showed that the chatbot helped students resolve complaints more efficiently (Ndunagu et al., 2025). The next study implemented a chatbot on a higher education web portal to provide automatic academic information, student support, and appointment services using Natural Language Processing and Large Language Model (Oliveira & Matos, 2023). The next study developed a trustworthy academic chatbot using Retrieval-Augmented Generation to improve factual accuracy and reduce hallucination in responses generated by Large Language Model (Husain et al., 2025). limited studies have implemented an AI-based chatbot specifically for academic information services through WhatsApp, which is more familiar and accessible for students in daily communication. Therefore, this research offers a practical implementation by integrating n8n and Google to provide automatic responses related to academic schedules, course registration, and administrative information efficiently

### 2.2. Theoretical Background

#### 2.2.1 *Chatbot*

A chatbot is a computer application designed to simulate conversation or interactive communication with users (humans) through text, voice, or visual interfaces. The interaction that occurs between the computer and the user is generated as a response from a program that has been previously configured and stored in a computer database (Rahmawati & Sudrajat, 2025).

#### 2.2.2 Virtual Assistant

A virtual assistant, in a general context, is a computer program or an Artificial Intelligence-based application designed to perform specific tasks automatically through human-like interaction, whether via text, voice, or visual communication (Haqiqi et al., 2024).

#### 2.2.3 Artificial Intelligence

Artificial Intelligence is a field of computer science that focuses on developing systems or machines capable of imitating, simulating, and performing tasks that normally require human intelligence, such as learning, reasoning, and self-correction (Afandi & Kurnia, 2023).

#### 2.2.4 Academic Services

Academic services are a series of service activities provided by educational institutions, particularly higher education institutions, to the academic community (students, lecturers, and educational staff), either directly or indirectly, with the primary objective of supporting the achievement of the institution's academic goals (Hanitha et al., 2024).

## METHODS

The research method used in the development of an AI-Based Virtual Assistant Chatbot for Academic Information Services at the Faculty of Engineering, Universitas Hamzanwadi consists of several main stages, as follows:

### 3.1. Observation

Observation was conducted to directly examine how academic information services operate at the Faculty of Engineering, Universitas Hamzanwadi. Through this observation, the researcher identified procedures and challenges in delivering academic information services, gained insight into how the current system operates, recognized complaints or difficulties experienced by students and staff in accessing information, and identified obstacles related to the use of technology in information delivery.

### 3.2. Interview

Data collection through interviews was conducted by carrying out face-to-face communication or direct conversations with related parties at the Faculty of Engineering, such as lecturers, students, and administrative staff. The purpose of these interviews was to obtain more in-depth information regarding the needs of academic information service users and their views on the potential implementation of an artificial intelligence-based virtual assistant chatbot to improve the quality of academic services. Interviews with students were conducted to determine the extent to which they were satisfied with the existing academic information

system, the problems they often encountered when seeking information related to lectures, examinations, and other academic administration matters, as well as to explore whether they saw opportunities for a virtual assistant chatbot system to help them access information more easily and quickly. Meanwhile, interviews with academic and administrative staff aimed to understand the internal processes of managing academic information at the faculty level, identify existing obstacles in data management, and examine how a virtual assistant chatbot could help streamline processes and improve efficiency. Through these interviews, the author aimed to gain deeper insights into users' needs and expectations regarding a technology-based academic information system, as well as to obtain valuable input for developing a chatbot system that is more effective and suited to user needs.

### 3.3. Literature Review

To deepen the understanding of the research topic and support data collection obtained from interviews and observations, the author conducted a literature review by examining references related to chatbot concepts, the application of chatbots in education, academic information systems, and relevant journals, books, and articles.

### 3.4. System Development Method

This study adopted a system development method using the waterfall model. The selection of the waterfall model was based on its systematic and sequential characteristics, which allow each stage to be completed in order before moving to the next stage (Kurniawan et al., 2021).

1. Research Object Determination
   The first step was to determine the main focus of the study, namely the development of an artificial intelligence-based virtual assistant chatbot to provide academic information services. This study focused on the Faculty of Engineering at Universitas Hamzanwadi, with the aim of improving access to information and service efficiency.
2. Problem Identification
   At this stage, the problems to be addressed through the use of the chatbot were identified. These could include difficulties in obtaining academic information quickly, dependence on manual services, or inaccuracies in the information provided. For example, this chatbot is intended to make it easier for students to obtain information related to academic schedules, procedures for applying for academic leave, or other academic services.
3. Data Collection and Analysis
   At this stage, the data needed to develop the chatbot were collected. These included data related to frequently asked questions by students, common interaction patterns in information services, and literature studies on the use of chatbots in the context of academic information services.
4. System Design and Development
   Based on the collected data, the chatbot system was designed and developed using n8n for workflow automation and Gemini for natural language processing. The chatbot was integrated with WhatsApp as a communication platform that is more frequently used by students.
5. Testing and Initial Evaluation
   After the development phase was completed, the system was tested to evaluate the chatbot's functionality in delivering information to users. At this stage, testing was conducted to measure how effectively the chatbot understood and responded to user questions, while also providing feedback for further system improvement.
6. Chatbot Implementation
   After completing the testing and evaluation stages, the chatbot was implemented on a limited basis at the Faculty of Engineering of Universitas Hamzanwadi. Users could then begin using the chatbot to obtain academic information efficiently.

### 3.5. System Analysis and Design

The current system implemented at the Faculty of Engineering of Universitas Hamzanwadi requires students to come directly to campus to ask for various academic information. This creates several problems, such as inefficiency in terms of time and effort, especially for information that could actually be accessed independently. In addition, the limited number of administrative staff, restricted working hours, and the high volume of repetitive questions that must be answered repeatedly result in slower administrative processes, longer waiting times for students, and an increasing workload for administrative staff, especially during busy periods such as the beginning of the semester or re-registration periods. For a clearer illustration, this condition is shown in Figure 1.

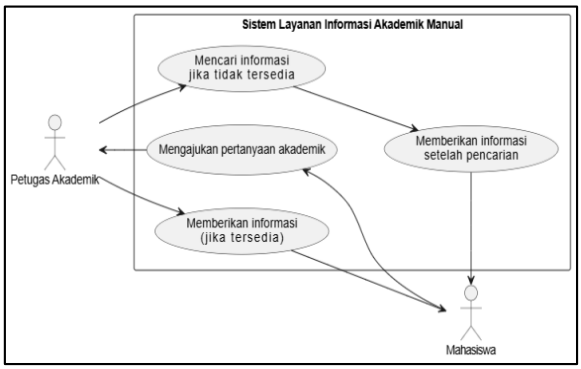


Figure 1. Manual Information Service Flow

The proposed system is the use of an artificial intelligence (AI)-based chatbot to provide academic information services to students through WhatsApp. With this system, students can easily obtain academic information at any time without having to come to campus. The chatbot operates 24 hours a day and can provide fast and accurate automatic responses, thereby reducing the workload of administrative staff and improving service efficiency. The use of WhatsApp as a communication platform also makes the chatbot more accessible to students. For a clearer illustration, the proposed system is presented in Figure 2.

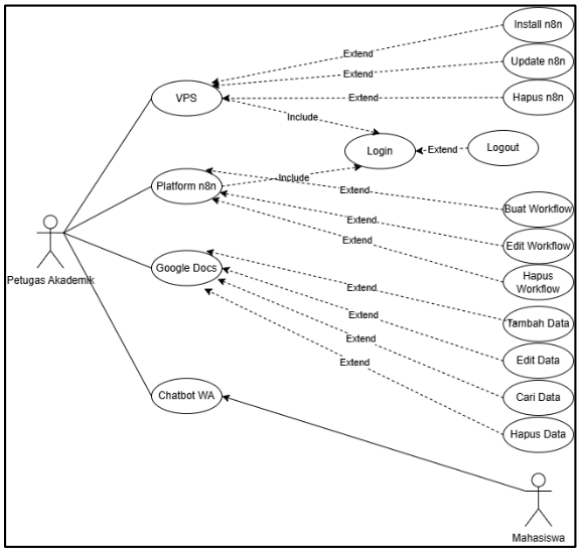


Figure 2. System Design Use Case

The workflow of the proposed chatbot system can be described as shown in Figure 3.

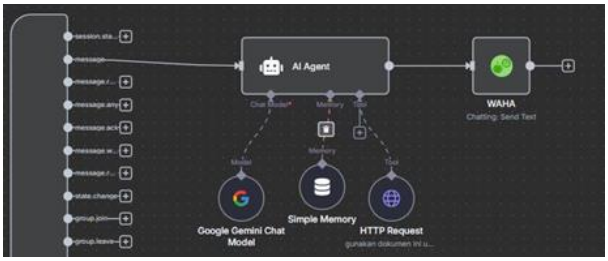


Figure 3. Chatbot Workflow

The proposed system begins with a WhatsApp trigger as the starting point of the workflow. When a student sends a message to the WhatsApp number connected to the system, the application automatically triggers the workflow and forwards the information for further processing. The message is then sent to the AI agent, which is responsible for processing the conversation. The AI agent identifies the context of the question and selects the appropriate model to generate a relevant response. In addition, the AI agent manages conversations through a structured workflow system and stores previous interactions using simple memory. This memory stores important information mentioned during the conversation so that the chatbot can provide more consistent and relevant responses in subsequent interactions.

The next process involves the use of the Gemini chat model, which utilizes Natural Language Processing (NLP) technology to understand the intent of students' questions. NLP is a branch of artificial intelligence that focuses on the interaction between computers and human language (Nurwanda et al., 2024). After processing the message, the model generates a relevant response based on the data available in the system and can also learn from previous conversations to improve response accuracy. If the chatbot requires additional information that is not available in memory or within the system, it can send an HTTP request to access external data or other resources stored in Google Docs. This allows the chatbot to provide more accurate and up-to-date answers. After obtaining the appropriate response, WhatsApp is used to send the reply to the student.


Figure 4. Greeting Message


Figure 5. Question About KRS

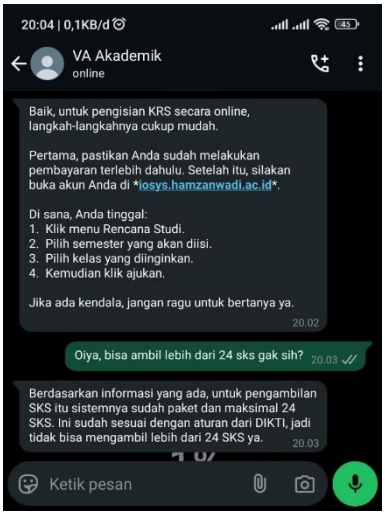


Figure 6. Question About Taking More Than 24 Credits

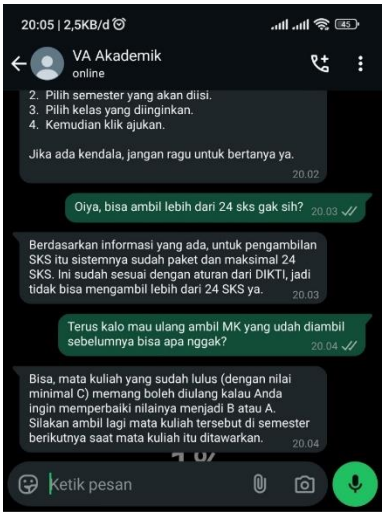


Figure 7. Question About Repeating a Course

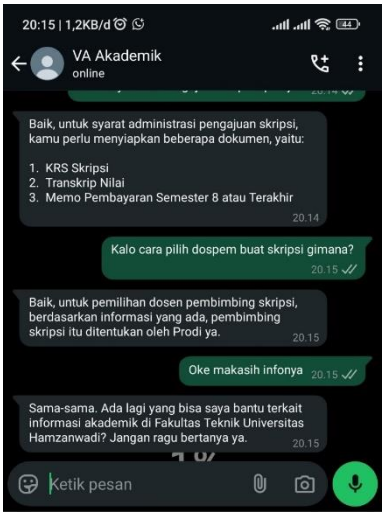


Figure 8. End of Conversation

## RESULTS AND DISCUSSION

### 4.1. Result

Testing was conducted to evaluate the performance of the virtual assistant chatbot in providing academic information services. This testing included various question scenarios involving students seeking information related to academic procedures. The results of this testing show how effectively the chatbot provides accurate responses and how the system handles various questions submitted by users.

Table 1. Chatbot Testing Results

| No | Question | Question Status |
|---|---|---|
| 1 | How do I fill out KRS online? | Answered |
| 2 | Is it possible to take more than 24 credits? | Answered |
| 3 | Can I repeat a course that I have already passed? | Answered |
| 4 | Can I take upper-semester courses? | Answered |
| 5 | What is the procedure for taking courses across semesters? | Answered |
| 6 | What happens if I am late in filling out KRS? | Answered |
| 7 | When can I start taking my thesis course? | Answered |
| 8 | What are the administrative requirements for thesis submission? | Answered |
| 9 | How do I choose a thesis supervisor? | Answered |
| 10 | What should I do if I want to change my thesis title? | Answered |

The Table 1 shows the results of chatbot testing on ten submitted questions. Of the ten questions tested, all were answered successfully by the chatbot, as indicated in the question status column marked "Answered." The tested questions covered various topics, including procedures for online KRS submission, taking more than 24 credits, procedures for changing a thesis title, and other related questions. All of these questions were answered correctly, indicating that the chatbot is capable of handling various types of questions related to academic information.

**4.2 Discussion**

The chatbot testing implemented at the Faculty of Engineering of Hamzanwadi University showed satisfactory results. All test questions submitted were answered successfully by the chatbot, as indicated in the question status column marked "Answered." This shows that the chatbot is able to provide fast, accurate, and relevant responses to students' questions. The tested questions covered various important academic aspects, such as KRS submission procedures, course repetition, and thesis application procedures. By providing adequate answers, the chatbot successfully created a more efficient interaction experience for students who need academic information.

In its implementation, this chatbot system contains approximately 90 question data entries stored in the database. From this number, 10 sample questions were randomly selected for testing in an interaction simulation. Each question submitted during the testing was answered adequately, indicating the Chabot's ability to understand and respond to questions effectively. Administrators can add or update question and answer data according to changes in academic policies or new information needs required by students. Whenever there is a policy change, administrators only need to adjust or add relevant answers in Google Docs. These updates are then integrated with the chatbot in a short time.

One of the main advantages of implementing this chatbot is the improvement of service efficiency. Before the chatbot was introduced, students had to come directly to campus or wait a long time to obtain information from administrative staff. This not only disrupted students' time but also increased the workload of administrative staff. With the chatbot, students can access academic information anytime and anywhere through WhatsApp, reducing dependence on manual services that are limited by time and location. The chatbot also operates 24 hours a day, providing easy access without time limitations, which in turn increases student satisfaction with academic services. The implementation of this chatbot also helps reduce the workload of administrative staff. Previously, administrative staff had to handle repetitive questions; with the chatbot answering these questions automatically, administrative staff can focus on more complex tasks that require human interaction, such as consultations on more in-depth academic issues.

In addition, the use of technologies such as Natural Language Processing (NLP) combined with a Large Language Model (LLM) in the chatbot enables a deeper understanding of students' questions. This technology allows the chatbot to provide responses that are not only fast but also contextual and relevant, according to the pattern of questions submitted. This demonstrates how advanced the chatbot is in providing services that closely resemble human interaction.

However, although the chatbot can provide answers to various general questions, the system still has limitations in handling more specific questions or those that require further adjustment to campus policies. For example, when a question involves more complex academic issues or policy

changes, the chatbot may require updated information or clarification from administrative staff.

## CONCLUSION

This study examined the implementation of an artificial intelligence-based virtual assistant chatbot in providing academic information services at the Faculty of Engineering of Universitas Hamzanwadi. The results showed that the chatbot was able to provide fast, accurate, and relevant responses to various questions related to academic procedures. This system proved to improve the efficiency of academic services by reducing the administrative workload that was previously handled manually. The use of technologies such as Natural Language Processing (NLP) and Large Language Models (LLMs) enabled the chatbot to provide contextual and in-depth answers, closely resembling human interaction. Testing conducted on the chatbot showed that all questions were answered successfully, indicating the system's readiness to provide the information needed by students.

For future development, the chatbot system can be integrated directly with the campus academic database to provide real-time updated information. The chatbot can also be enhanced to handle more complex questions through improved contextual understanding and adaptive learning features. In addition, an administrator dashboard can be developed to monitor chatbot performance and update the knowledge base efficiently. The system may also be expanded to support other academic services, such as course registration, class schedule notifications, and academic payment reminders.

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