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Implementation Of Natural Language-Based Chatbot Processing On The LPPMB Web at UNIQHBA

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ABSTRACT: The development of artificial intelligence technology, particularly Natural Language Processing (NLP), has provided significant opportunities to improve the quality of information services in various sectors, including higher education. In the new student admissions (PMB) process, providing fast, accurate, and easily accessible information is a crucial requirement for prospective students. However, limited customer service often leads to delays in information delivery. This study aims to implement an NLP-based chatbot on the LPPMB website of Qamarul Huda Badaruddin University (UNIQHBA) to improve the efficiency of PMB information services. The research method is descriptive and quantitative, and the system development uses the Agile method. Data were collected through observation, interviews, and documentation. The chatbot system was developed by utilising the n8n platform for workflow automation and an NLP-based AI model for natural language processing. System testing was carried out through chatbot response testing and measuring user satisfaction using the Customer Satisfaction Score (CSAT). The results showed that the chatbot provided real-time, relevant responses to user questions about PMB. In addition, the user satisfaction rate reached 85%, indicating that the system effectively met information needs. Thus, the implementation of an NLP-based chatbot has been proven to improve the quality of information services and reduce the workload of customer service personnel. This research is expected to serve as a reference for developing chatbot systems in educational settings.

Keyword : Artificial Intelligence, Chatbot, Higher Education, NLP, Student Admissions

I. INTRODUCTION

Higher education plays a strategic role in producing high-quality human resources capable of competing in the era of globalisation [1]. As information technology advances, educational institutions must continually innovate to improve the quality of academic and administrative services. Digital transformation is a crucial step in supporting service efficiency and effectiveness, particularly in the delivery of information to students and prospective students [2].

One technology that has developed rapidly in recent years is Artificial Intelligence (AI), particularly in the field of Natural Language Processing (NLP). NLP enables computer systems to understand, interpret, and respond to human language naturally [3]. This technology has been widely applied in various fields, such as customer service, e-commerce, and educational information systems, due to its ability to improve human-machine interaction [4].

In the context of new student admissions (PMB), the availability of fast, accurate, and easily accessible information is crucial for prospective students. Information regarding registration procedures, administrative requirements, tuition fees, and selection schedules is often needed quickly. However, limited customer service means that not all inquiries can be handled optimally, especially outside of operating hours. This can hinder the delivery of information and reduce service quality [5].

To address this issue, a technology-based solution is needed that can automatically and in real time provide information services. Chatbots are one technology that can address this need. Chatbots are AI-based applications that can interact with users through text or voice conversations [6] By utilising NLP, chatbots can understand user questions and provide relevant responses based on the conversation context [7].

Several previous studies have shown that implementing NLP-based chatbots can improve service efficiency and user satisfaction. Hikmah et al. [8] developed an academic service chatbot with high accuracy in answering user questions. Agustina et al. [9] also stated that chatbots can improve interaction efficiency and reduce response times in information services. Furthermore, Salamun and Aprialdo [6] demonstrated that chatbots can assist with administrative tasks and facilitate user access to information.

However, the implementation of chatbots in website-based new student admissions systems, particularly those integrated with workflow automation such as n8n and modern AI models, remains limited. Therefore, this study aims to implement a Natural Language Processing-based chatbot on the LPPMB UNIQHBA website to improve information service efficiency and user satisfaction in the new student admissions

II. RELATED WORK

Research on the application of Natural Language Processing (NLP)-based chatbots has been extensively conducted in various fields, particularly in information services. Chatbot technology is capable of improving communication efficiency between users and systems by providing fast, accurate automated responses.

Hikmah et al. [8] developed an NLP-based chatbot for academic services. The system they developed could understand user questions and provide contextually relevant answers. The results showed that the chatbot achieved high accuracy in answering frequently asked questions. However, this research was limited to specific academic services and had not been directly integrated with a real-time web-based system.

Furthermore,, Agustina et al. [9] implemented an NLP-based chatbot in a tourism village information service. The results showed that the chatbot improved interaction efficiency and expedited the delivery of information to users. However, the developed system still had limitations in understanding more complex variations in user language.

Research by Apriliani et al. [10] developed a chatbot as an information service medium in educational settings. The chatbot provided relevant information and facilitated user access. However, the system remained dependent on specific scenarios, limiting its flexibility in handling diverse types of questions.

Salamun and Aprialdo [6] researched chatbot optimisation using NLP to improve information services. The results showed that chatbots can help improve service efficiency and reduce administrative workload. However, this research has not been specifically applied to a website-based new student admissions system.

Based on these studies, NLP-based chatbots have good capabilities in improving the quality of information services. However, most studies still have limitations in real-time system integration and have not been widely applied to website-based new student admissions systems integrated with workflow automation. Therefore, this study developed an NLP-based chatbot integrated with the n8n

platform on the LPPMB UNIQHBA website to provide more effective, efficient, and accessible information services in real time.

III. METHOD

Figure 1. Step-by-step of research

A. Type of Research

This research uses a descriptive, quantitative approach. The descriptive method is used to describe the implementation process of a Natural Language Processing (NLP)-based chatbot. In contrast, the quantitative approach is used to measure user satisfaction with the developed system.

B. Research Flow

This research was conducted through several structured stages, starting from problem identification to system evaluation. The research flow aims to ensure that the chatbot development process is systematic and meets user needs. The research flow used in this study shown in Fig. 1

Figure 1. Step-by-step of research

Based on Figure 1, the research began with the problem identification stage, which examined the issues encountered in the new student admissions (PMB) information service, particularly regarding limitations in delivering information to prospective students. The next stage was data collection, conducted through observation, interviews, and documentation to obtain the information needed for system development. The collected data was then analysed in the requirements analysis stage to determine the specifications of the chatbot system to be developed.

This was followed by the system design stage, which involved defining the architecture and workflow of the chatbot using Natural Language Processing (NLP). The next stage was system implementation, during which the chatbot was developed using the n8n platform and integrated with an AI model for natural language processing.

The developed system is then tested in the testing phase to determine the chatbot's ability to provide appropriate responses to user queries. The final stage is evaluation, which assesses system performance based on test results and user satisfaction levels.

C. System Development Methods

The chatbot system development in this study used the Agile method. The Agile method was chosen because it is iterative and flexible, allowing system development to be carried out in stages and to adapt to dynamic user needs ***[11]***.

In this study, the Agile method was applied through several stages, namely:

1. Planning

This stage was conducted to identify system requirements based on the results of problem analysis and data collection. At this stage, the chatbot's main features were determined, including the ability to answer questions about new student admissions (PMB).

2. Development
   This stage involved developing a Natural Language Processing (NLP)-based chatbot system using the n8n platform for workflow automation and integration with AI models to process user input.
3. Testing
   The testing stage was conducted to ensure that the chatbot system functioned properly, including its ability to understand questions and provide appropriate responses.
4. Review
   This stage evaluated the system development results based on the test results to identify any remaining deficiencies in the system.
5. Retrospective
   This final stage was conducted to make improvements and refinements to the system based on the evaluation results, so that the chatbot system could run more optimally.

By using Agile methods, the system development process can be carried out iteratively, resulting in a system that better meets user needs.

D. System Design

The developed chatbot system consists of several main components, namely:

1. A user interface (chat interface) integrated into the website
2. The n8n platform as workflow automation
3. An AI agent as a liaison between system components
4. A Natural Language Processing (NLP)-based artificial intelligence model using Gemini

In general, the system receives text input from the user via the website interface. This input is then processed by the n8n platform, which manages the system workflow, including sending requests to the NLP model. The AI model then performs natural language processing to understand the question's intent and generates a relevant response. The resulting response is then sent back to the user through the chatbot interface.

E. System Testing

System testing was conducted to evaluate the chatbot's performance in providing information services to users. The evaluation used two approaches: functional testing and user-based testing.

1. System Response Testing (Functional Testing)
   This testing was conducted by asking several questions related to New Student Admissions (PMB). The goal was to assess the chatbot's ability to understand questions and generate relevant, contextually appropriate answers. The evaluation was conducted by observing the correspondence between the questions posed and the responses generated by the system.
2. User Satisfaction Testing (Customer Satisfaction Score / CSAT)
   This test aimed to measure user satisfaction with the developed chatbot system. Measurement was conducted using the Customer Satisfaction Score (CSAT) method, in which users were asked to rate their experience after interacting with the chatbot. The CSAT score was calculated based on the average user satisfaction score, which was then used to assess the system's acceptance level.

IV. RESULT AND DISCUSSION

This section describes the research methodology employed to develop and evaluate the chatbot system based on Natural Language Processing (NLP) on the LPPMB UNIQHBA website. The system was developed using the Agile method, while data collection was conducted through observation, interviews, and documentation. System evaluation was carried out through functional testing to assess the chatbot's response accuracy and performance, as well as usability evaluation using the Customer Satisfaction Score (CSAT) to measure user satisfaction.

A. Chatbot System Impementation

The chatbot implementation in this study was carried out by integrating Natural Language Processing (NLP) technology into the LPPMB UNIQHBA website. The system was built using the n8n workflow automation platform, which serves as a link between the user interface and the NLP-based AI model.

In general, the chatbot system workflow begins with user input via the website, which is then processed by the n8n system, which acts as a communication flow manager. The data is then forwarded to the AI model for processing using an NLP approach, enabling the system to understand the question's intent and provide an appropriate response. The following illustration illustrates the overall system workflow:

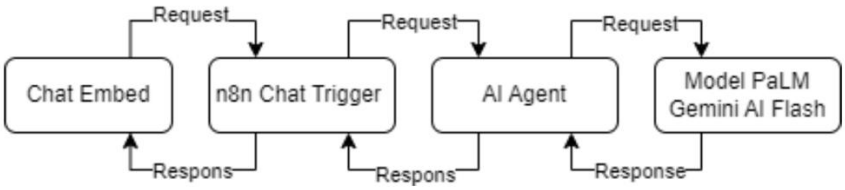

Figure 2. Chatbot System Architecture

Fig 2. shows that the chatbot system operates in an integrated manner, from user input to the production of relevant responses. This integration enables communication to occur automatically and in real time, without human intervention.

B. Chatbot Implementation on the n8n Platform

In the implementation phase, the chatbot was developed using the n8n platform, which enables the integration of various system components without complex coding. n8n is used to manage the process flow, from receiving user input to sending a response back to the user. This system has several main components:

- Chat Trigger, which functions to receive input from the user
- AI Agent, which connects the system with the NLP model
- AI Model (Gemini), which processes natural language

The chatbot implementation on the n8n platform is shown below:

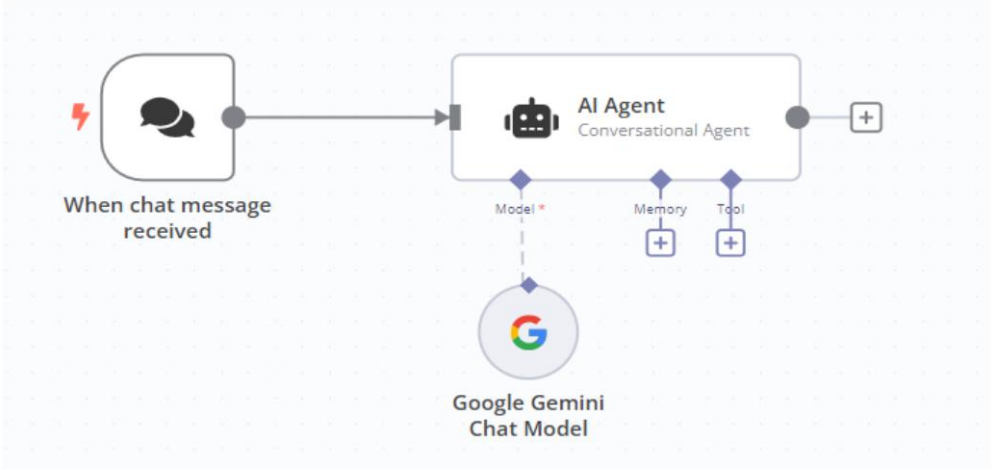

Figure 3. Chatbot Workflow on n8n

Fig 3. shows how the integration flow between components works within a single workflow. With this system, the inquiry-handling process can be automated, eliminating the need for manual intervention from customer service.

C. Implementation on the LPPMB Website

After the system integration process was complete, the chatbot was implemented on the LPPMB UNIQHBA website. The chatbot is displayed as a chat interface accessible directly by users.

The chatbot implementation on the website can be seen below:

Figure 4. Chatbot Implementation on the Website

According to Fig 4, users can easily ask questions about the new student admissions process without having to come to campus or contact customer service.

D. Chatbot Response Test Result

System testing was conducted by asking a set of questions commonly asked by prospective students, including registration procedures, document requirements, tuition fees, and selection schedules.

Based on the results of the thesis test, the chatbot provided appropriate responses to most of the questions. This indicates that the system can understand the context of the user's questions and provide relevant answers.

Furthermore, the chatbot also demonstrated superior response speed, providing answers in real time. This speed is an added advantage compared to manual services, which take longer. These results indicate that implementing NLP in chatbots can improve the quality of interactions between users and the system, as also found in previous research ***[8]***

E. User Satisfaction Score (CSAT) Test Result

User satisfaction testing was conducted using the Customer Satisfaction Score (CSAT) method. Based on the analysis in this thesis, it was found that: 85% of users were satisfied with the chatbot service. This satisfaction level indicates that the chatbot can meet users' information needs during the new student admissions process. The main factors influencing user satisfaction include:

- Ease of use of the system
- Speed of response
- Relevance of answers to questions

Thus, the chatbot not only functions as an information tool but also enhances the user experience in accessing the new student admissions service.

F. Chatbot Performance Analysis

The chatbot's performance in this study was analysed based on its ability to:

- Understand user questions
- Provide relevant answers
- Respond quickly

The analysis results indicate that the chatbot performed quite well in handling general questions. However, the system still has limitations in understanding complex or ambiguous questions. These limitations indicate that although NLP technology can improve language understanding, dataset quality and system design remain important factors in determining chatbot performance.

G. Discussion

The results of this study indicate that implementing an NLP-based chatbot improves the efficiency of information services in the new student admissions process. Compared to manual services, chatbots have several advantages, namely:

- Providing 24-hour service
- Reducing customer service workload
- Providing instant responses

These findings align with previous research that suggests chatbots can improve interaction efficiency and service quality [9] [11]. However, chatbots still have limitations in understanding the context of complex questions. Therefore, further development is needed, such as:

- Adding a variety of question datasets
- Improving the NLP model
- Integrating with a knowledge base

H. Research Implication

This research demonstrates that NLP-based chatbots can be an effective solution for improving information services in higher education. The implications of this research include:

1. Improving the quality of student admissions (PMB) services
2. Optimising the use of AI technology in education
3. Potential development of chatbot systems for other academic services

V. CONCLUSION

This research successfully implemented a Natural Language Processing (NLP)-based chatbot on the LPPMB UNIQHBA website to improve the quality of new student admissions information services. Based on testing results, the system was able to provide relevant, real-time responses to user inquiries and demonstrated good performance in understanding common questions. The Customer Satisfaction Score (CSAT) evaluation showed a user satisfaction rate of 85%, indicating that the chatbot was effective in meeting information needs. Furthermore, the chatbot implementation was proven to improve service efficiency and reduce customer service workload. However, the system still has limitations in handling complex questions, requiring further development through improving dataset quality, NLP models, and integration with knowledge bases. Thus, NLP-based chatbots have significant potential to support the digital transformation of information services in higher education.

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