



Design and Development of a Chatbot-Integrated Website Profile for Madrasah Tsanawiyah to Improve Academic Information Services

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Abstract

The rapid advancement of information technology has driven educational institutions to improve the quality of their information services. MTs Sambong Jaya faces challenges in delivering academic information due to its inactive website, resulting in limited accessibility for students and the community. This study aims to develop a madrasah profile website integrated with a rule-based chatbot to enhance the effectiveness of academic information services. This research employed the Research and Development (R&D) method based on the Borg and Gall model, including needs analysis, planning, development, validation, testing, and evaluation stages. The chatbot was designed using predefined question-answer patterns to provide automated responses to user inquiries. The evaluation results show that expert validation achieved a score of 90% (Very Feasible), Blackbox Testing indicated a 100% success rate for all system functions, and user responses reached 81.71% (Very Good). These findings indicate that the developed system is functional, user-friendly, and capable of improving access to academic information.

Keywords: Madrasah Profile Website; Chatbot; Rule-Based Chatbot; Academic Information Services; Borg and Gall.



1. Introduction

The rapid advancement of information and communication technology has driven significant transformation across various sectors, including education. The utilization of information systems enables more efficient data management, faster information dissemination, and supports data-driven decision-making processes within educational institutions (Dewa & Azizah, 2024; Firdaus, 2024; Nabihah Riandika *et al.*, 2024). In the educational context, web-based information systems have become a primary medium for delivering information to students, teachers, parents, and the broader community. School websites not only function as platforms for institutional profiling but also serve as channels for disseminating academic information, announcements, news, and facilitating communication. The use of websites has been proven to enhance transparency and improve the effectiveness of information services without limitations of time and location.

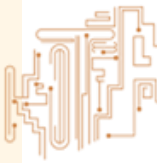
Along with the advancement of digital technology, the application of Artificial Intelligence (AI) has increasingly been adopted to improve educational services. AI enables systems to process data, recognize patterns, and provide automated responses to user queries. One widely implemented form of AI is the chatbot, an application designed to simulate human-like conversations using natural language. Based on their development approach, chatbots can be categorized into several types, one of which is the rule-based chatbot.

This type of chatbot operates based on predefined question-answer patterns and structured rules. Compared to AI-based chatbots that require complex models, high computational resources, and continuous training, rule-based chatbots are easier to develop, more efficient to maintain, and particularly suitable for services involving repetitive queries, such as academic information services in schools. Previous studies have demonstrated that the implementation of chatbots and school websites can improve the speed of information services, reduce administrative workload, and increase user satisfaction. However, most existing research focuses on developing either websites or chatbots separately, or utilizes AI-based approaches that require substantial computational resources. Studies that integrate a school profile website with a rule-based chatbot, particularly in the context of madrasah education, remain limited.

Based on observations conducted at MTs Sambong Jaya, the previously used website is no longer active, resulting in academic information services being delivered manually through teachers or administrative staff. This condition leads to delays in information delivery, especially for frequently asked questions. These challenges highlight the need for an information service system that is fast, accessible, and capable of providing automated responses. Therefore, this study aims to develop a madrasah profile website integrated with a rule-based chatbot to improve the effectiveness of academic information services. This research contributes by proposing a simple, efficient, and easily maintainable system that aligns with the needs of users in the madrasah environment.

2. Methodology

This study employed the Research and Development (R&D) method using the Borg and Gall model, as it is suitable for developing and producing a product in the form of a madrasah profile website integrated with a rule-based chatbot. This model was selected because it provides systematic stages, ranging from needs analysis to product evaluation, ensuring that the developed system meets user requirements. The research stages consisted of: (1) needs analysis, (2) data collection, (3) system design, (4) product development, (5) expert validation, (6) product testing, (7) evaluation and revision, and (8) final product.



Data were collected through observation, interviews, documentation, and questionnaires. Observation was conducted to identify system requirements and problems related to academic information services at MTs Sambong Jaya. Interviews were carried out with school stakeholders to obtain information regarding user needs and existing information service workflows. Documentation was used to collect school profile data, organizational structure, and other supporting documents. Meanwhile, questionnaires were used to measure system feasibility and user responses to the developed website. The system testing involved 32 respondents consisting of teachers, administrative staff, and students of MTs Sambong Jaya. The sampling technique used was total sampling, in which all members of the population were included as research samples due to the relatively small population size and their direct involvement as system users.

The website was developed using the CodeIgniter framework with a MySQL database. The chatbot was implemented using a rule-based approach by defining a set of rules in the form of question patterns and corresponding responses. These rules were designed based on academic information needs, such as school profiles, class schedules, academic calendars, announcements, and student admissions information. When users submit a query, the system matches the input with predefined patterns stored in the knowledge base, enabling the chatbot to generate appropriate responses automatically.

System evaluation was conducted through software engineering expert validation, Blackbox Testing, and user response testing. Expert validation aimed to assess the system in terms of functionality, interface design, and usability. Blackbox Testing was performed to evaluate system functionality without considering the internal code structure. User response testing was conducted using a five-point Likert scale questionnaire, covering indicators such as ease of use, website appearance, system performance, ease of accessing information, and overall user satisfaction with the chatbot-integrated madrasah profile website.

3. Results and Discussion

3.1 Results

This study resulted in the development of a madrasah profile website integrated with a rule-based chatbot for MTs Sambong Jaya. The website was designed as an academic information service platform that can be accessed by students, teachers, parents, and the general public through computers and smartphones. The system provides centralized and real-time academic information, enabling users to obtain information efficiently without having to visit the school directly.

3.1.1 Homepage

The homepage is the main interface displayed when users access the website. It contains general information about the madrasah, navigation menus, and access to key features of the system.

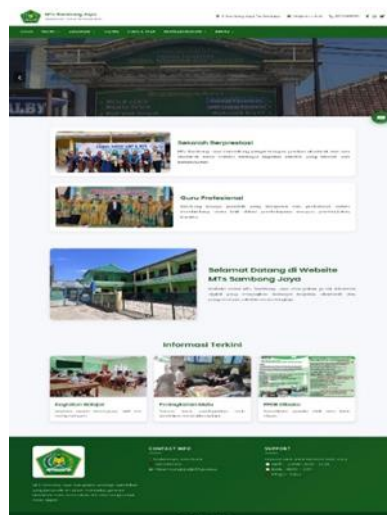


Figure 1. Homepage

3.1.2 Chatbot Page

The chatbot page serves as an interactive communication medium between users and the system. Users can submit questions related to academic information, and the system automatically generates responses based on a predefined knowledge base.

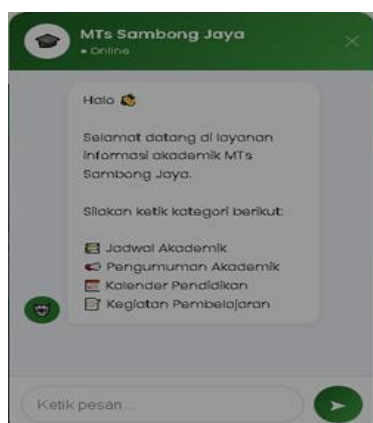


Figure 2. Chatbot Initial Page



Figure 3. Chatbot Question Interface

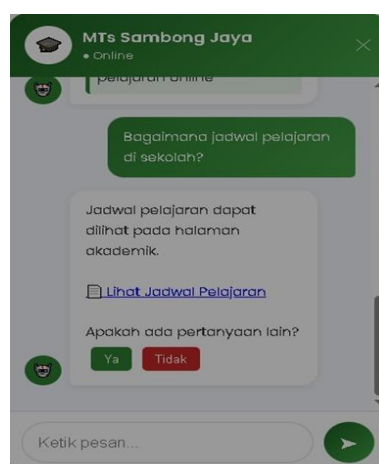


Figure 4. Chatbot Response Interface



3.1.3 Academic Page

The academic page provides essential information related to teaching and learning activities, including: Academic schedule, Announcements, Academic calendar, Learning activities.



Figure 5. Academic Page

3.1.4 Admin Page

The admin page is used to manage all website data. Administrators can manage madrasah profiles, academic content, teacher data, galleries, news, and the chatbot knowledge base.

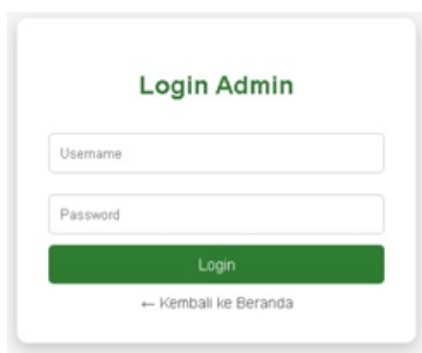


Figure 6. Admin Login Page

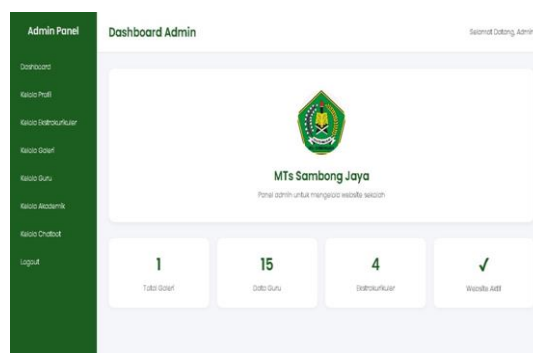


Figure 7. Admin Dashboard

3.1.5 Software Engineering Expert Validation Results

The system was validated by a Software Engineering expert to evaluate its feasibility based on functionality, usability, and interface aspects.

Table 1 Software Engineering Expert Validation Results

No	Evaluation Aspect	Result	Description
1	System interface	Works properly	Valid
2	Ease of use	Easy to use	Valid
3	Website menu functions	All functions work properly	Valid
4	System access speed	Accessible properly	Valid
5	System response	Responds to user input	Valid
6	Chatbot feature	Provides responses	Valid



7	Navigation	Works properly	Valid
8	Interface consistency	Consistent display	Valid
9	Information clarity	Clearly presented	Valid
10	Data management	Data can be added, edited, deleted	Valid
11	Admin login	Functions properly	Valid
12	System security	Access restriction works	Valid
13	Functional suitability	Meets user needs	Valid
14	Admin usability	Easy to manage data	Valid
15	System efficiency	Runs efficiently	Valid
16	System performance	Performs well	Valid

The validation result obtained a score of 72 out of 80, resulting in a percentage of 90%, which falls into the “Very Feasible” category. This indicates that the system meets software quality standards and is suitable for implementation.

3.1.6 Blackbox Testing Results

Blackbox Testing was conducted to ensure that all system functionalities operate according to user requirements without considering the internal code structure.

Table 2 Blackbox Testing Results

No.	Feature Tested	Test Scenario	Expected Result	Test Result	Status
1	Admin Login	Correct input	Redirect to dashboard	As expected	Valid
2	Admin Login	Incorrect input	Error message displayed	As expected	Valid
3	Profile Management	Add data	Data stored	As expected	Valid
4	Extracurricular	CRUD operations	Successful	As expected	Valid
5	Gallery	Upload/edit/delete	Successful	As expected	Valid
6	Teacher Management	CRUD operations	Successful	As expected	Valid
7	Academic Management	CRUD operations	Successful	As expected	Valid
8	Chatbot Management	CRUD operations	Successful	As expected	Valid
9	Chatbot	User input	Relevant response	As expected	Valid
10	Logout	Click logout	Return to login page	As expected	Valid

The results show that all system features function properly, and all test scenarios achieved a Valid status.



3.1.7 User Response Results

User response testing involved 32 respondents, including students, teachers, and administrative staff of MTs Sambong Jaya. The total score obtained was 1961 out of a maximum score of 2400, resulting in a percentage of 81.71%, categorized as “Very Good.” These results indicate that: The website is easy to use, The interface is visually appealing Information is easily accessible, The chatbot effectively assists users.

3.2 Discussion

The results indicate that the development of a madrasah profile website integrated with a rule-based chatbot was successfully implemented using the Research and Development (R&D) method with the Borg & Gall model. From the system feasibility perspective, the expert validation score of 90% indicates that the system meets software quality standards, particularly in terms of functionality, usability, and interface design. From the functional perspective, the Blackbox Testing results demonstrate that all system features operate correctly without errors, indicating a high level of system reliability. From the user perspective, the user response score of 81.71% shows that the system is well accepted. Users find it easy to use and helpful in accessing academic information quickly and efficiently.

The integration of a rule-based chatbot provides added value by enabling automatic responses to frequently asked questions. This reduces repetitive inquiries and improves the efficiency of information services. These findings are consistent with previous studies indicating that chatbot implementation can enhance information service effectiveness, and that website-based systems improve information accessibility. The novelty of this study lies in the integration of a madrasah profile website with a rule-based chatbot within a single system. However, the chatbot still has limitations, as it can only respond to predefined patterns. Therefore, future research is recommended to develop chatbot systems based on Artificial Intelligence (AI) or Natural Language Processing (NLP) to improve flexibility in understanding user queries.

4. Conclusion

Based on the results of the study, it can be concluded that the profile website of MTs Sambong Jaya integrated with a rule-based chatbot was successfully developed using the Research and Development (R&D) method with the Borg and Gall model. The developed website is capable of providing digital academic information services, making it easier for students, parents, teachers, and the general public to access information quickly, easily, and efficiently. The expert validation results obtained a percentage of 90%, categorized as “Very Feasible,” indicating that the website meets the requirements as an academic information service medium.

The Blackbox Testing results showed that all system functions operated according to functional requirements, while the user response test obtained a percentage of 81.71%, categorized as “Very Good.” These results indicate that the system is well accepted by users and effectively supports academic information services at MTs Sambong Jaya. However, this study still has limitations, as the chatbot developed uses a rule-based approach, meaning it can only respond to questions stored in the knowledge base and cannot yet understand variations of questions beyond predefined rules. Therefore, future research is recommended to develop chatbot systems based on Artificial Intelligence (AI) or Natural Language Processing (NLP) to enable more flexible natural language understanding, provide more adaptive responses, and further optimize academic information services.



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