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Strategies to Enhance Literacy and Access to Muhammadiyah Information through ChatMu Innovation

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Abstract

This research aims to evaluate the ChatMu application as a solution to facilitate access to information about Muhammadiyah for Muhammadiyah members. Evaluation methods utilized include System Usability Scale (SUS) testing and analysis of the accuracy and availability of information provided by the application. The SUS testing results indicate that the majority of users tend to be satisfied with the application's usability, although there are still some weaknesses, particularly related to navigation and information consistency. Additionally, evaluation of the accuracy of answers provided by ChatMu shows that the application has the potential to provide accurate and relevant information. However, it is crucial to note that the availability of up-to-date information requires continuous updating and attention. The main finding of this research is that ChatMu has significant potential to enhance accessibility and literacy regarding Muhammadiyah among its members. Recommendations for further development include improving the application's usability, updating the latest information, and developing additional features to enhance interaction between users and the application. With further development efforts, ChatMu has the potential to become an effective solution in improving literacy and information access regarding Muhammadiyah for its members.

Keywords: *Application Chatmu, Chatbot, Artificial Intelligence, Muhammadiyah, System Usability Scale.*

INTRODUCTION

Muhammadiyah members currently face challenges in accessing information related to Muhammadiyah affairs. Despite being a large organization with an extensive network, the limitation in accessing information remains a major obstacle for most of its members. One of the primary complicating factors is the lack of conversion of information into digital formats (Maghfiroh et al., 2023; Okan, 2021). ost information about Muhammadiyah is still available in conventional formats such as printed books, magazines, and other materials, which are not easily accessible to all individuals (Fanani et al., 2021). Moreover, with the rapid advancement of information technology, much of the information about Muhammadiyah that should be accessible digitally is not.

This situation is further exacerbated by the unequal access to the internet across Indonesia. While some urban areas have relatively good internet access, many rural areas lack internet coverage or have very limited access. This not only makes it difficult for most Muhammadiyah members in rural areas to access digital information but also limits access to conventional information (Ariaji et al., 2021; Berardi et al., 2023).

To address this issue, innovative and effective solutions are greatly needed. One proposed solution is the use of ChatMu, an artificial intelligence-based chatbot designed specifically to facilitate access to information about Muhammadiyah for its members. ChatMu is designed considering the needs and preferences of users, with WhatsApp chosen as its platform base.

Previous research has highlighted the information access challenges faced by Muhammadiyah members regarding Muhammadiyah affairs. Research conducted by Hariyadi et al. (2021) indicated that most

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Muhammadiyah members have difficulty accessing information about Muhammadiyah teachings and values, especially in rural areas with limited internet access. Similar findings were also presented by a study conducted by Pasaribu & Suyanto (2020) and Nalendro & Wardani (2020), which highlighted that the lack of conversion of information into digital forms was a major obstacle in improving literacy of Muhammadiyah among Muhammadiyah citizens. The research carried out by Burhani (2018) found that most information about Muhammadiyah is still available in conventional formats, such as print books and magazines, which are difficult to access by most members, especially the younger generation who are more accustomed to digital technology.

WhatsApp was chosen as the primary platform for ChatMu due to its widespread popularity among Indonesian society. WhatsApp has become one of the most commonly used communication platforms, especially in Indonesia. Its easy and intuitive usage makes it an ideal choice for providing information services to Muhammadiyah members (Alamer & Al Khateeb, 2023; Ortiz et al., 2018). Additionally, the presence of WhatsApp allows ChatMu to be accessed through various types of devices, including smartphones commonly used by Indonesian society.

Research on ChatMu marks a significant step forward in addressing the challenges of information access faced by Muhammadiyah members, particularly regarding Muhammadiyah affairs, while enriching the literature by considering the application of current technologies. A study conducted by Borsci et al. (2022) highlights the importance of technological innovation in improving information accessibility, especially among communities with special needs such as Muhammadiyah members. In this context, the presence of the ChatMu application is considered crucial because it not only provides easily accessible sources of information but also creates an interactive platform for sharing experiences and knowledge among fellow Muhammadiyah members.

A study conducted by Cheng & Jiang (2022) demonstrates that the use of AI-based chatbots can significantly improve efficiency in providing information and services to users. Thus, the presence of ChatMu as an AI-based chatbot integrated with the WhatsApp platform not only meets the need for fast and accurate information access for Muhammadiyah members but also opens up opportunities for the effective use of technology in religious and cultural contexts.

In order to better understand the complexity of information access issues among Muhammadiyah members, this research also proposes innovative solutions by considering the accessibility disparities between urban and rural areas in Indonesia. For example, research by Zhou et al. (2020) shows that the use of information and communication technology, such as mobile applications, can be a solution to reduce the information access gap between urban and rural areas. Thus, ChatMu is not just an information application but also an initiative to provide inclusive and sustainable technological solutions for the Muhammadiyah community.

Efforts to ensure the successful implementation of ChatMu require consideration of several important factors. Firstly, the development of comprehensive content and information databases is key to providing quality and relevant services. The information provided by ChatMu must be accurate, reliable, and aligned with the needs and interests of users (N. A. Khan & Albatein, 2021). Secondly, it is important to provide training and support to users to ensure that they can effectively utilize ChatMu's features and functionalities (Nobre et al., 2020). Through adequate training, it is expected that Muhammadiyah members can quickly and effectively adapt to the use of ChatMu.

Furthermore, in the long term, the development and maintenance of ChatMu also require sustained commitment and support from various stakeholders, including Muhammadiyah officials and members, as well as other relevant parties such as technology developers and artificial intelligence experts (Gomaa et al., 2023). With strong support from all parties involved, it is hoped that ChatMu can become an effective solution in improving access to and literacy of Muhammadiyah affairs among Muhammadiyah members, and contribute positively to the development and advancement of Muhammadiyah as a dynamic and progressive Islamic organization and movement (Putri et al., 2022).

Based on the explanations above, conclusions can be drawn regarding the research questions: whether all Muhammadiyah members can easily and quickly obtain information about Muhammadiyah affairs through ChatMu; how accurate the answers provided by ChatMu are in responding to each question from Muhammadiyah members; and whether the information provided by ChatMu is up-to-date.

METHOD

The research methodology employed in this study is the ADDIE approach, which stands for Analysis, Design, Development, Implementation, and Evaluation. This approach is a common framework used in the development of learning programs or technology solutions focused on user needs (Yabu et al., 2021). Below is an explanation of the application of the ADDIE approach in this research:

Analysis

The first step in this methodology is to conduct a thorough analysis of the information access issues related to Muhammadiyah affairs faced by Muhammadiyah members. This analysis will include evaluating the level of Muhammadiyah literacy, factors influencing information accessibility, and user needs and preferences in accessing such information. To enrich this analysis, the information sources used by the ChatMu application are described in Table 1, which includes various relevant databases such as official Muhammadiyah publications, news archives, and scholarly sources, providing a strong foundation for the development and customization of application features according to user needs.

Table 1. Database ChatMu

Information Source	Description
The Book of *"Himpunan Putusan Tarjih Muhammadiyah"*	is an official document issued by the Tarjih and Tajdid PP Muhammadiyah Assemblies. This book contains the decisions derived from the National (Munas) Tarjih Decision. The Tarjah Decision occupies the strongest position in the hierarchy of the decisions made by the tarjih and tajdid assemblies (Iqbal & Suyono, 2018).
Book of *"Tanya Jawab Agama"*	It's a collection of hundreds of questions asked by citizens from all walks of life. The questions were answered by the Tarjih and Tajdid Assemblies and covered various religious themes. To date, there are at least eight editions of the book "Tanya Jawab Agama" that have been published (Rachmadhani et al., 2022).
Book of *"Al-Islam dan Kemuhammadiyahan"*	is a textbook prepared to provide students with insight into the basic material of Muhammadiyah (Lahmi et al., 2022).
Suara Muhammadiyah Magazine and Tabloid	is one of the sources of Muhammadiyah da'wah which is printed and distributed to all Muhammadiyah residents to find out the latest news about Muhammadiyah, and the Suara Muhammadiyah website is a website which contains news or news or all activities about Muhammadiyah (Zara, 2022).
Tanfidz Muktamar	the official publication issued by Muhammadiyah after the holding of Muktamar, a major conference held by the organization on a periodic basis. Muktamar Muhammadiyah is the highest forum in the organizational structure, where members from all over Indonesia gather to discuss and define policies, programmes of work, and organizational strategies for the next period (Burhani, 2023).

Design

After conducting the analysis, the next step is Design, where the designed solution should align with the identified user needs and characteristics (Ma & Zhang, 2021). This design phase involves the development of features and functionalities of the ChatMu application, including the development of an intuitive user interface, efficient database structure, and effective content delivery strategies to users. The design of the ChatMu application is illustrated in Figure 1.

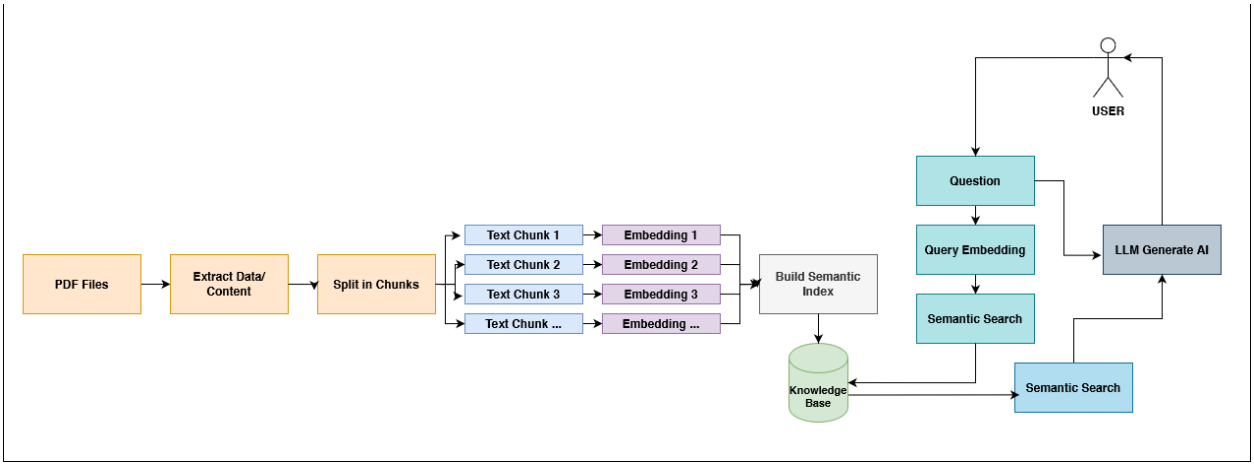


Figure 1. ChatMu Processing Structure

Development

Once the design is completed, the next step is to develop ChatMu based on the formulated design. In this context, the ChatMu application is designed using the Python programming language, utilizing the PyPDF2 library to process PDF-format database files (Anki & Bustamam, 2021), as described in Table 1. The next step involves creating server endpoints to run the designed program, ensuring that the application can communicate with the server efficiently. These endpoints are then integrated into the smartphone-based platform using the WhatsApp application. WhatsApp was chosen because it is a widely used messaging application in Indonesia, especially among Muhammadiyah members, who predominantly use WhatsApp for communication (Mendoza et al., 2023). During the development process, testing and iterations will be conducted to ensure that ChatMu functions properly and meets the expected quality standards. The workflow of the ChatMu application is illustrated in Figure 2.

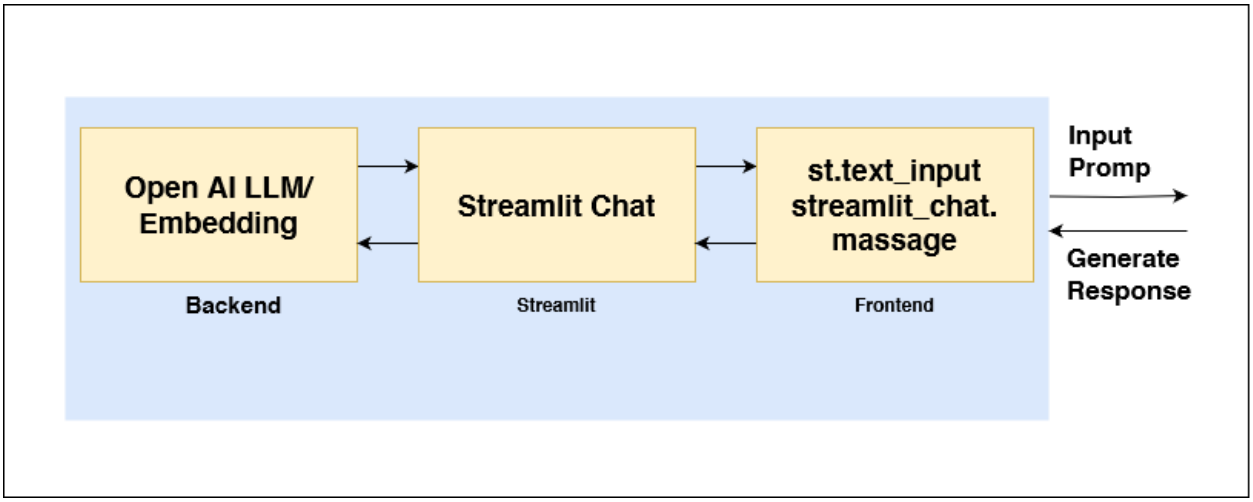


Figure 2. PDF Chat Architecture

Implementation

Upon completion of the development phase, ChatMu will be implemented for Muhammadiyah members. Before implementing the ChatMu application, developers will test the application using the black-box testing method. Black-box testing is a software testing method that focuses on the external functions of the application without considering its internal structure or code (Huynh et al., 2019). In black-box testing, various features and functionalities of ChatMu will be tested to ensure that the application functions as

expected and provides accurate responses to user requests (Sharma et al., 2021). Additionally, testing will be conducted to check the stability of the application, responsiveness to various types of input, and integration with the WhatsApp platform. The results of this testing will be used for improvement and refinement before ChatMu is widely implemented for Muhammadiyah members.

Evaluation

The final step is the evaluation of the effectiveness and efficiency of ChatMu in facilitating access to information about Muhammadiyah affairs for Muhammadiyah members. This evaluation will involve collecting data on the usage of ChatMu, user satisfaction levels, improvements in Muhammadiyah literacy, and the positive impact of ChatMu usage. After implementation, the evaluation will involve distributing questionnaires using the System Usability Scale (SUS) method. SUS is a measurement method used to evaluate the usability and user experience of a system or application (Lewis, 2018). With SUS, users are asked to evaluate various aspects of the application's usability, such as ease of use, efficiency, and overall user satisfaction (Thamilarasan et al., 2023). The results of the evaluation using SUS will provide a deeper understanding of how well ChatMu is used by users and areas that need improvement. Thus, the evaluation results will serve as a basis for further adjustments and improvements, as well as a guide for further solution development.

RESULT AND DISCUSSION

Before implementing the ChatMu application for users, an important step is to conduct blackbox testing to ensure that all features and functions can run smoothly. Blackbox testing is conducted as part of the application development process to validate system performance from the user's perspective without considering the internal structure or code of the application (Dahito et al., 2023). According to Darla & A (2021) with blackbox testing, developers can identify and fix potential bugs or issues in the application before it is presented to end users. This is crucial to ensure that the user experience with the ChatMu application is positive and meets expectations. Testing using blackbox testing is illustrated in Table 2.

Table 2. ChatMu Blackbox Test Results

Tested Features	Input	Expected Output	Test Result
Introduction Initial Greetings	"Assalamualaikum"	Response from the system	Valid
Introduction Initial Greetings	"Hi"	Response from the system	Valid
Introduction to Questions	"Apa itu Muhammadiyah?"	Relevant answers about Muhammadiyah	Valid
Introduction to Questions	"What is Muhammadiyah?"	Relevant answers about Muhammadiyah	Valid
Use of Bahasa Indonesia	Questions in Bahasa Indonesia	Correct answer in Bahasa Indonesia	Valid
Use of English	Questions in English	Correct answer in English	Valid
Consistency of Answers	Same question in different languages	The answer is the same and consistent	Valid

Based on the results of blackbox testing conducted on the ChatMu application in Table 2, this application has successfully passed a series of tests with satisfactory results. This aligns with the research by Kirinuki & Tanno (2024) which indicates that large language models like ChatGPT can produce test cases that generally match or slightly exceed test cases created by human participants in terms of test coverage. Key features such as initial greeting recognition, question recognition, and the use of both Indonesian and English languages have performed well and provided outputs as expected. The use of different languages also did not affect the consistency of answers provided by the application, indicating the application's ability to respond well to user requests in various language contexts. This demonstrates that the ChatMu application has been well-designed and developed to meet the needs and preferences of users in accessing information about Muhammadiyah.

The results of blackbox testing provide confidence that the ChatMu application is ready to be implemented for users with reliable and consistent performance. Other research by Pavlik (2023) also indicates that large

language models like ChatGPT have impressive capabilities in various applications, including essay writing and programming, which supports the results of blackbox testing.

The use of the ChatMu application seems quite straightforward; users only need to enter the designated number. From the provided description, the process of using the application appears to be quite simple and intuitive. The first step users take is to greet, such as "Assalamualaikum" or "Hi," before asking questions. Subsequently, the system provides a welcome response along with instructions for users to ask questions related to Muhammadiyah by inserting the word "Muhammadiyah" in their questions. This step helps the system to provide more accurate and relevant answers to the intended topic. This process is illustrated in Figure 3.

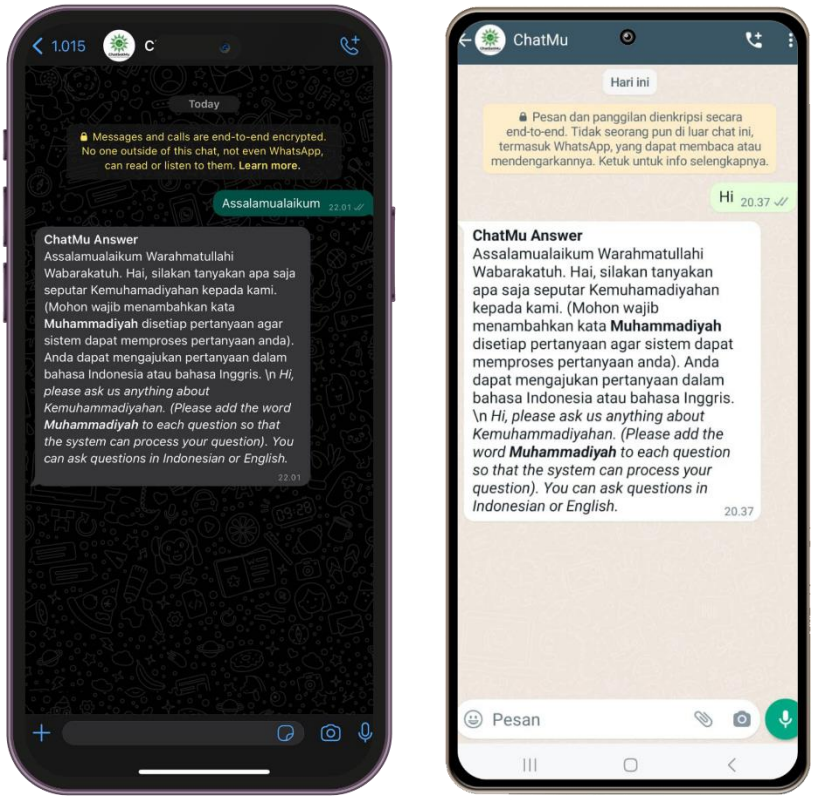
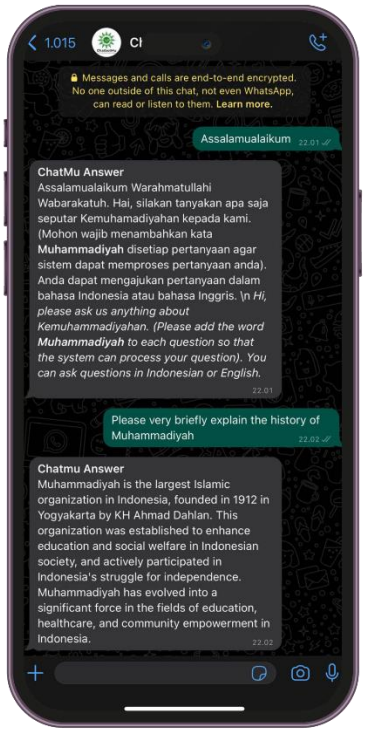


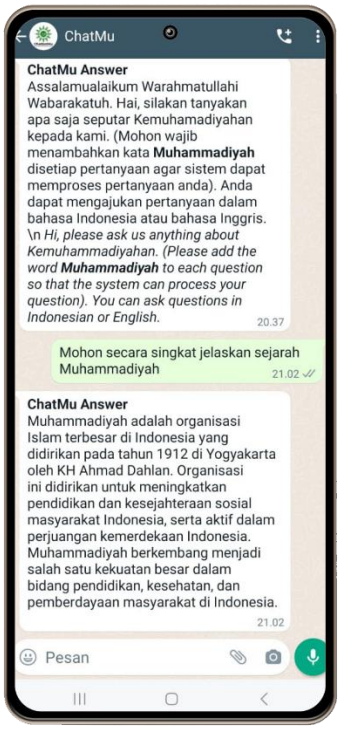
Figure 3. Initial System Response and Providing Instructions for Using the Application

Based on Figure 3, it can be concluded that the ChatMu system is capable of responding well and appropriately to initial greetings from users, as expected. The following are the initial response results from the system after users greet.

Assalamualaikum Warahmatullahi Wabarakatuh. *Hai, silakan tanyakan apa saja seputar Kemuhamadiyahan kepada kami. (Mohon wajib menambahkan kata Muhammadiyah disetiap pertanyaan agar sistem dapat memproses pertanyaan anda). Anda dapat mengajukan pertanyaan dalam bahasa Indonesia atau bahasa Inggris.* \n Hi, please ask us anything about Kemuhammadiyahan. (Please add the word Muhammadiyah to each question so that the system can process your question). You can ask questions in Indonesian or English.

In addition to ease of use, the ChatMu application also supports the use of two languages, namely Indonesian and English. Users can ask questions in their preferred language, thereby expanding the usage of this application to various segments of society, including those who may not be fluent in the Indonesian language. As seen in Figure 4, users use two different devices, namely devices with Android and iPhone operating systems, with the aim of comparing the accuracy and consistency of the answers provided by the application.



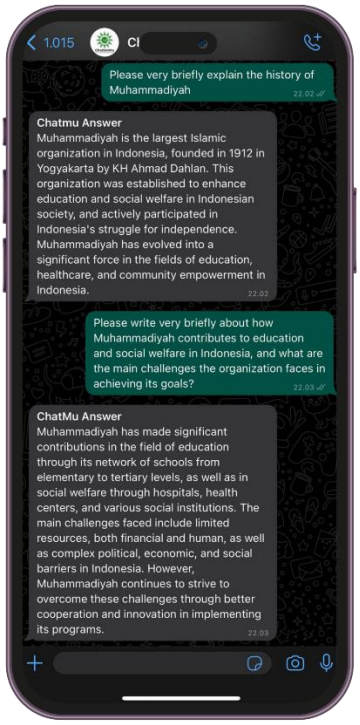


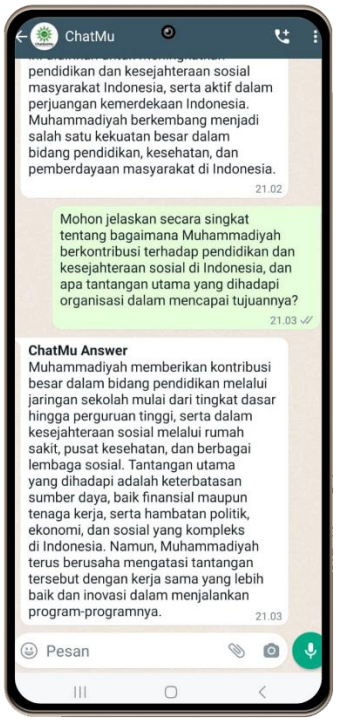
Direct Translation from English Answer (iPhone)		Direct Translation of Indonesia Answer (Android)	
Q	Please very briefly explain the history of Muhammadiyah	Q	*Mohon jelaskan secara singkat sejarah Muhammadiyah*
A	Muhammadiyah is the largest Islamic organization in Indonesia, founded in 1912 in Yogyakarta by KH Ahmad Dahlan. This organization was established to enhance education and social welfare in Indonesian society, and actively participated in Indonesia's struggle for independence. Muhammadiyah has evolved into a significant force in the fields of education, healthcare, and community empowerment in Indonesia.	A	*Muhammadiyah adalah organisasi Islam terbesar di Indonesia yang didirikan pada tahun 1912 di Yogyakarta oleh KH Ahmad Dahlan. Organisasi ini didirikan untuk meningkatkan pendidikan dan kesejahteraan sosial masyarakat Indonesia, serta aktif dalam perjuangan kemerdekaan Indonesia. Muhammadiyah berkembang menjadi salah satu kekuatan besar dalam bidang pendidikan, kesehatan, dan pemberdayaan masyarakat di Indonesia.*

Note: Q : Question | A : Answer

Figure 4. ChatMu System Response in Answering Questions from Users

Testing on the first question, users ask questions about an explanation of the history of Muhammadiyah, as seen in Figure 4. Looking at the results presented in Figure 4, on both devices with Android and iPhone operating systems, the questions asked are the same but in different languages. However, the answer results from both devices are the same, indicating the consistency and accuracy of the answers provided by the application, even though the questions are asked in different languages. This demonstrates the ChatMu application's ability to understand and respond well to user requests, regardless of the language used by the user.





	Direct Translation from English Answer (iPhone)		Direct Translation of Indonesia Answer (Android)
Q	Please write very briefly about how Muhammadiyah contributes to education and social welfare in Indonesia, and what are the main challenges the organization faces in achieving its goals?	Q	*Mohon jelaskan secara singkat tentang bagaimana Muhammadiyah berkontribusi terhadap pendidikan dan kesejahteraan sosial di Indonesia, dan apa tantangan utama yang dihadapi organisasi dalam mencapai tujuannya?*
A	Muhammadiyah has made significant contributions in the field of education through its network of schools from elementary to tertiary levels, as well as in social welfare through hospitals, health centers, and various social institutions. The main challenges faced include limited resources, both financial and human, as well as complex political, economic, and social barriers in Indonesia. However, Muhammadiyah continues to strive to overcome these challenges through better cooperation and innovation in implementing its programs.	A	*Muhammadiyah memberikan kontribusi besar dalam bidang pendidikan melalui jaringan sekolah mulai dari tingkat dasar hingga perguruan tinggi, serta dalam kesejahteraan sosial melalui rumah sakit, pusat kesehatan, dan berbagai lembaga sosial. Tantangan utama yang dihadapi adalah keterbatasan sumber daya, baik finansial maupun tenaga kerja, serta hambatan politik, ekonomi, dan sosial yang kompleks di Indonesia. Namun, Muhammadiyah terus berusaha mengatasi tantangan tersebut dengan kerja sama yang lebih baik dan inovasi dalam menjalankan program-programnya.*
Note: Q : Question | A : Answer			

Figure 5. ChatMu System Response in Answering Questions from Users

Testing on the second question displays a more substantive nature as it involves a more complex process for the system. In this case, the ChatMu system is challenged to do more than just respond to user requests (R. A. Khan et al., 2023). Instead, the system must be able to read, collect, and analyze the information contained in the question to provide accurate and relevant answers (Cooper, 2023). This process involves understanding the context and substance of the questions asked by users, thus requiring a higher level of processing from the system.

Use of the system as illustrated in Figure 5, helps to illustrate the interaction between users and the system, as well as highlighting the complexity of the questions and answers involved (Rahman & Watanobe, 2023). By visualizing this interaction, the importance of the ChatMu system's ability to accurately understand and respond to user requests can be seen, especially when the questions require substantial analysis to provide satisfactory answers (Halaweh, 2023).

Testing on the second question provides a deeper understanding of the system's performance and capabilities in facing more complex challenges in providing meaningful answers to users. Research by Hoque et al. (2023) shows that large language models like ChatGPT can support complex question-answering scenarios and increase audience engagement. However, other research by Bahak et al. (2023) shows that although ChatGPT

demonstrates competence as a generative model, it is less effective in answering questions compared to task-specific models.

From the results presented in Figure 5, it can be concluded that the ChatMu system still demonstrates consistency in providing answers to questions asked by users, regardless of the device or language used. This consistency is reflected in the results showing that there is no significant difference between the answers provided by the system for questions asked by users via iPhone devices using English and Android devices using Indonesian (Kavaz et al., 2023). Previous research conducted by Lew et al. (2018) has also shown that in online chat-based communication, agents typically use pre-composed responses and talk to multiple customers simultaneously to increase efficiency. However, this technique can affect conversational interactivity-contingency dimensions and response latency that can undermine interpersonal assessment, satisfaction, and organizational relationships with customers. This means that the system has been able to provide consistent and relevant answers to the content of the questions asked, without discrimination based on the language or device used by the user. This is in line with future research directions in the field of chatbot, which include user experience and design, frameworks and platforms, chatbots for collaboration, chatbot democratization, as well as ethics and privacy (Følstad et al., 2021).

Direct Translation from English Answer (iPhone)		Direct Translation of Indonesia Answer (Android)	
Q	Please write very briefly abou how does Muhammadiyah view the relationship between religion and state in the context of Indonesia, and how has this view changed throughout the history of the organization?	Q	*Mohon jelaskan secara singkat tentang Bagaimana Muhammadiyah memandang hubungan antara agama dan negara dalam konteks Indonesia, dan bagaimana pandangan ini telah berubah sepanjang sejarah organisasi?*
A	Muhammadiyah holds a moderate view on the relationship between religion and the state in Indonesia, prioritizing principles of justice, democracy, and pluralism. Over time, Muhammadiyah has consistently adapted to Indonesia's political and social dynamics while maintaining a commitment to moderate values, tolerance, and democracy. The organization remains dedicated to creating an inclusive society and collaborates with other institutions to achieve this goal.	A	*Muhammadiyah memiliki pandangan yang moderat terhadap hubungan antara agama dan negara di Indonesia, mengutamakan prinsip keadilan, demokrasi, dan pluralisme. Seiring berjalannya waktu, Muhammadiyah selalu beradaptasi dengan dinamika politik dan sosial Indonesia, tetap mengedepankan nilai-nilai moderat, toleransi, dan demokrasi. Organisasi ini terus berkomitmen untuk menciptakan masyarakat yang inklusif dan bekerja sama dengan lembaga lain untuk mencapai tujuan tersebut.*

Note: Q : Question | A : Answer

Figure 6. ChatMu System Response in Answering Questions from Users

To reconfirm the performance of the ChatMu system, users attempt to provide more substantive and technical questions. This challenge is intended to test the system's ability to handle more complex questions and ensure that the system can continue to function well in more challenging situations. By asking deeper questions, users can push the system's ability to understand the context and substance of the questions asked, as well as its ability to provide relevant and meaningful answers.

Research conducted by Carmichael et al. (2022) has shown that in online chat-based communication, agents typically use pre-composed responses and talk to multiple customers simultaneously to increase efficiency. However, this technique can affect the dimensions of interaction-contingency and response latency that can undermine interpersonal assessment, satisfaction, and organizational relationships with customers. This process also aims to test the boundaries of artificial intelligence implemented in the ChatMu system. The use of tables and figures, as seen in Figure 6, helps to illustrate the interaction between users and the system in facing more complex questions. By visualizing this interaction, we can see how the ChatMu system responds to user requests in more challenging situations and understand the extent of the system's ability to address these challenges.

Testing on more substantive and technical questions provides a deeper understanding of the performance and capabilities of the ChatMu system, as well as highlighting the potential and limitations of the artificial intelligence applied in this application (S et al., 2023). This aligns with future research directions in the field of chatbots, which include user experience and design, frameworks and platforms, chatbots for collaboration, chatbot democratization, as well as ethics and privacy (Rozi et al., 2023).

Based on the response results provided by the ChatMu system in Figure 6, it can be concluded that the presented answers remain substantive and relevant to the questions asked by users. Analysis of the interaction between users and the system indicates that answer consistency is maintained regardless of the language or device used by the user. Both the use of iPhone devices with English and Android devices with Indonesian produce uniform responses that align with the substance of the questions asked.

Previous research by de Arriba-Pérez et al. (2023) has also shown that in online chat-based communication, agents typically use pre-composed responses and talk to multiple customers simultaneously to increase efficiency. However, this technique can affect the dimensions of interaction-contingency and response latency that can undermine interpersonal assessment, satisfaction, and organizational relationships with customers (Chen et al., 2021).

This indicates that the ChatMu system is capable of understanding and responding well to various types of questions, languages, and contexts provided. Thus, the conclusion that can be drawn is that the system remains consistent in answering every user question, maintaining high standards of user experience. These results provide strong evidence of the reliability and capability of the ChatMu system in providing consistent and high-quality information services to users.

Consistency and accuracy in providing answers are crucial in building user trust in the application (Jungmann et al., 2019). With ChatMu's ability to provide consistent and accurate answers, wherever users use the application and in whatever language questions are asked, user satisfaction and trust in the application's quality will increase (Martin et al., 2020). This also indicates that the use of ChatMu can be a reliable and dependable solution in meeting users' information needs related to Muhammadiyah.

After going through the previous testing stages, the next step in evaluating the performance of the ChatMu system is to use the System Usability Scale (SUS) method (Kortum & Bangor, 2013). This method aims to evaluate the usability of the system from the user's perspective (Vlachogianni & Tselios, 2022a). By distributing the SUS questionnaire, users are asked to assess various aspects of system usability, such as ease of use, clarity of instructions, and overall user satisfaction (Cheah et al., 2023a). The questions from SUS are

illustrated in Table 3, providing a framework for data collection and further analysis regarding ChatMu system usability.

Table 3. List of SUS Testing Method Questions

No	Pertanyaan
1.	I think I will use this system again
2.	I find this system complicated to use
3.	I find this system easy to use
4.	I need help from other people or technicians in using this system
5.	I feel that the system features work as they should
6.	I feel there are many things that are inconsistent (not harmonious in this system)
7.	I feel like others will figure out how to use this system quickly
8.	I find this system confusing
9.	I feel there are no obstacles in using this system
10.	I need to get used to it first before using this system

The number of respondents in the testing is 35 respondents, consisting of two types: Muhammadiyah members and the general public who are not from Muhammadiyah. The diversity of these respondents allows for a broader and more representative view of system usability from various user perspectives. By involving both groups, usability evaluation not only considers the needs and preferences of Muhammadiyah members but also takes into account the user experience from outside the Muhammadiyah environment (Liang et al., 2018). The number of respondents in the testing is 35 respondents, consisting of two types: Muhammadiyah members and the general public who are not from Muhammadiyah. The diversity of these respondents allows for a broader and more representative view of system usability from various user perspectives. By involving both groups, usability evaluation not only considers the needs and preferences of Muhammadiyah members but also takes into account the user experience from outside the Muhammadiyah environment. This is important to ensure that the ChatMu system can be accessed and used effectively by various segments of society, not limited to Muhammadiyah members alone. In a study conducted by Yanfi et al. (2020), sability testing was conducted to measure the usability level of web-based applications. The study involved several respondents and measured variables such as Learnability, Efficiency, Memorability, Errors, and Satisfaction.

In interpreting the results of SUS, there are several criteria used, including SUS Score, Grade, and Adjective rating. First, the SUS Score is the result of calculating the average score of all questions in the SUS questionnaire. This score ranges from 0 to 100, where a higher score indicates better system usability according to users (Deshmukh & Chalmeta, 2024). For example, if the system obtains a SUS Score above 80.3, this indicates that most respondents consider the system to have good usability. However, to understand the significance of this score, it is necessary to further examine the grade and Adjective rating.

Second, the grade is a category that determines how well the system performs based on the SUS Score. Usually, the grade is divided into five categories: A, B, C, D, and F. Grade A is usually given for systems with a SUS Score above 80.3, indicating that the system is rated very good by users. Grade B is given for SUS Scores between 68 and 80.3, while grade C is given for SUS Scores of 68. Grade D is given for SUS Scores between 51 and 68, while Grade F is given for SUS Scores below 51.

Third, the Adjective rating is a qualitative description of system usability based on the SUS Score and grade obtained. This Adjective rating provides further insight into how users rate the usability of the system. For example, if the system obtains a SUS Score above 80.3 with grade A, the Adjective rating given may be "Excellent," indicating that most users are very satisfied with the usability of the system. Based on all the SUS results, they are illustrated in Table 4.

Tabel 4. Scale SUS Score

SUS Score	Grade	Adjective Rating
> 80.3	A	Excellent
68 – 80.3	B	Good
68	C	Okay

51-68	D	Poor
< 51	F	Awful

To calculate the SUS Score, the steps are as follows:

Decrease 1 of the user score for statements with strange numbers (1, 3, 5, 7, 9).

Decrease user score from 5 for statings with integer numbers (2, 4, 6, 8, 10).

Summate all scores that have been adjusted.

Summate all scores that have been adjusted. 4. Multiply the total by 2.5 to get the final SUS Score.

Thus, the formula is:

$$SUSScore = \left(\sum_{i=1}^{10} adjustedScores_i \right) \times 2.5$$

From the System Usability Scale (SUS) testing method, it was obtained that the ChatMu application scored 79. This score falls within the range of 68-80.3, corresponding to grade B and Adjective Rating "Good". The results of the SUS testing of the ChatMu application are illustrated in Figure 7.

The score of 79 indicates that most respondents rated the ChatMu application as a system with good usability. This score is above the threshold of 68, which is often considered as the cutoff point for acceptable usability. It indicates that most users feel that this application is easy to use, intuitive, and meets their needs in accessing information about Muhammadiyah. However, although the score is above average, there is room for improvement for the ChatMu application to achieve a higher score.

With grade B and Adjective Rating "Good", the ChatMu application is considered to be a fairly good system according to usability standards. Grade B indicates that the application has decent usability quality but still has room for improvement (Vlachogianni & Tselios, 2022b). However, the Adjective Rating "Good" depicts that users are generally satisfied with the experience of using this application. It signifies that although there are areas for improvement, the ChatMu application has provided a positive and satisfactory user experience (Derisma, 2020).

Further analysis of these results needs to look at specific aspects that influence the scores and categories given. Factors such as clarity of instructions, intuitiveness of design, response speed, and overall user satisfaction need to be further evaluated to identify areas where the application can be improved (Aljamaan et al., 2024). Additionally, user feedback also needs to be considered so that developers can identify specific issues and make appropriate improvements.

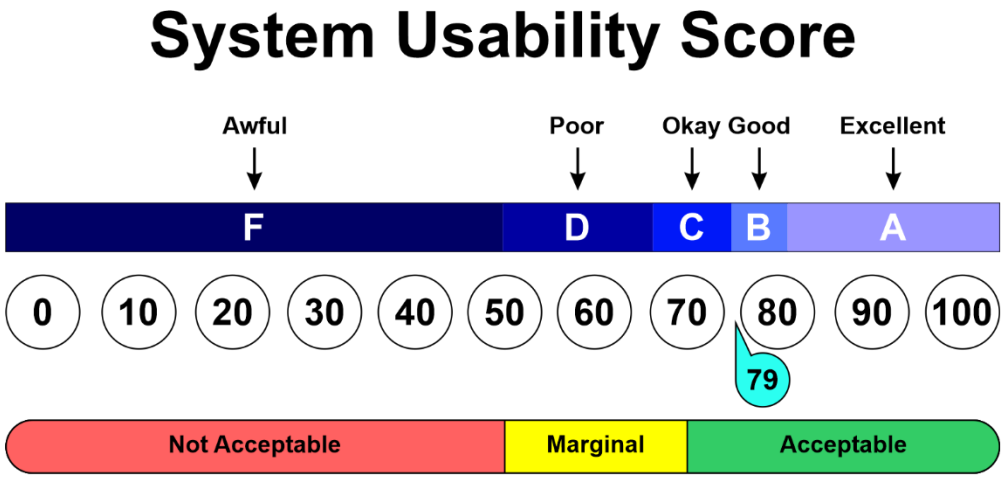


Figure 7. Result Score of SUS

Analysis of the SUS test results for odd and even questions indicates differences in user perceptions of the usability of the ChatMu system. From odd questions, such as Q1, Q3, Q5, Q7, and Q9, relatively high scores were obtained, averaging around 132. This indicates that users tend to agree that the ChatMu system is easy to use and intuitive. The high scores on odd questions indicate that the system excels in presenting information clearly, being responsive to user requests, and providing a satisfying user experience in the initial interaction with the application (Islam et al., 2021). However, it should be noted that the score on question Q5 is slightly lower than the others, indicating that there may be some areas that need further attention in terms of clarity or consistency of information.

From even questions, such as Q2, Q4, Q6, Q8, and Q10, the scores tend to be lower, averaging around 88. This indicates that users have more negative perceptions of certain aspects of the system's usability (Hidayat et al., 2022). For example, the low scores on questions Q8 and Q10 indicate that users may have difficulty in navigation or finding specific features in the application. Additionally, the low score on question Q4 suggests that there are issues with the clarity of instructions or guidance provided by the system.

Overall, the analysis of SUS scores indicates that the ChatMu system excels in presenting information clearly and being responsive to user requests. However, there are some weaknesses that need to be addressed, especially regarding less intuitive navigation, clarity of instructions, and consistency of information. To improve the usability of the system, further evaluation of areas with low scores and appropriate improvements based on user feedback are necessary (Cheah et al., 2023b). Thus, the ChatMu system can be more effective in meeting user needs and expectations, providing a better overall user experience. The results of the SUS testing through odd and even questions are illustrated in Figure 8.

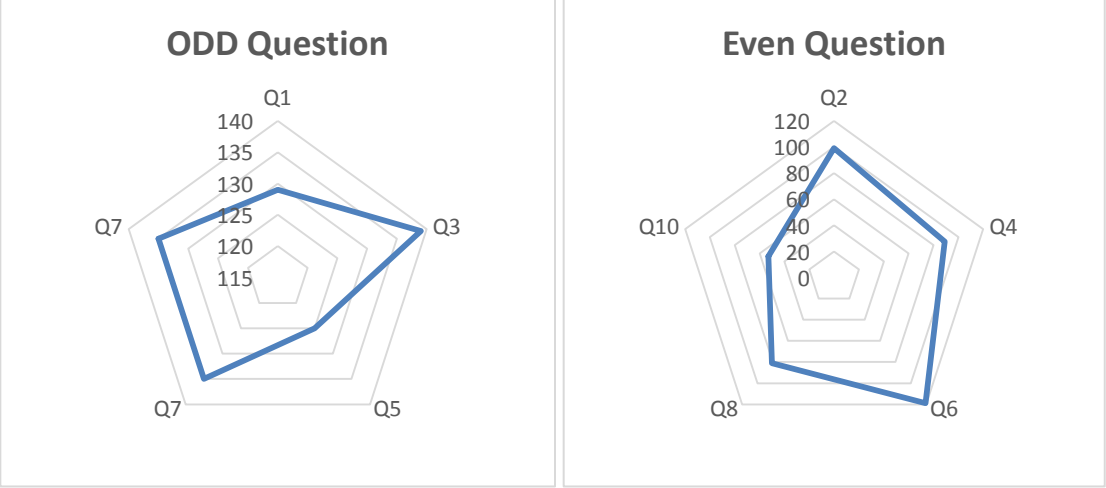


Figure 8. Result Test of SUS

Referring to the research questions, it indicates that some aspects have been addressed through SUS testing and other evaluations of the ChatMu application. Firstly, regarding the ease and speed of accessing information about Muhammadiyah through ChatMu, the results of the SUS testing show that most users tend to agree that the system is easy to use and responsive to requests (Vlachogianni & Tselios, 2022c). However, there are still some weaknesses, especially concerning less intuitive navigation and clarity of instructions. This indicates that while information accessibility may have been fulfilled for most users, there is still room for improvement to make the application more efficient and user-friendly for all Muhammadiyah members.

Secondly, regarding the accuracy of answers provided by ChatMu, SUS testing provides an overview that users are generally satisfied with the answers provided by the system. However, low scores on some even questions suggest that there is still room to improve the accuracy of answers, especially concerning consistency of information and clarity of instructions. Therefore, although most answers provided are proven

accurate, further evaluation is needed to ensure that all information presented by ChatMu meets high accuracy standards (Rahmatizadeh et al., 2024).

Thirdly, regarding the availability of up-to-date information, the results of the testing do not directly indicate whether the information provided by ChatMu is up-to-date. However, as part of further evaluation, further investigation into the sources of information used by ChatMu is necessary to ensure that the information presented is always updated and relevant to the latest developments in Muhammadiyah (Afif, 2023).

Thus, some aspects of the research questions have been addressed through the evaluations conducted, but there are still some aspects that need further evaluation to ensure that ChatMu meets all the needs and expectations of users effectively. Further evaluation and necessary improvements can help enhance the quality of the system and ensure that ChatMu becomes a reliable and relevant source of information for all Muhammadiyah members.

CONCLUSION

This study evaluates the ChatMu application's effectiveness in providing Muhammadiyah members with access to information about Muhammadiyah. Results indicate that ChatMu significantly improves information access and accuracy, although areas for usability enhancement remain. Despite navigation and consistency issues, ChatMu efficiently delivers relevant information. This underscores the potential of chatbot technology in addressing community-specific information needs. Future efforts should focus on larger-scale usability testing, ensuring information currency, and adding features for enhanced user engagement. With ongoing development, ChatMu has the promise to effectively enhance literacy and information access within the Muhammadiyah community.

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Declaration Of Interest Statement

We declare that the data will be available by individual application directly to the corresppponding author. We declare that we do not have any conflicts of interest regarding the reported study. We declare that the survey instrument has passed ethical standards by Universitas Muhammadiyah Surakarta ethic committee with number of code 199/B.1/KEPK-UMS/I/2024.

Author Contribution

All authors have a significant role in the perfection of this article. Muhammad Syahriandi Adhantoro acts as the head of this writer who writes and compiles articles, Dedi Gunawan and Harun Joko Prayitno have the task of processing data, Rahayu Febri Riyanti and Eko Purnomo are tasked with testing the system for users, and Adi Jufriansah helps Muhammad Syahriandi in creating applications Chatbots.

Data Availability

We do not analyse or generate any datasets, because our work proceeds within a theoretical and mathematical approach. One can obtain the relevant materials from the references below.

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