OPEN ACCESS
International Journal of Advances in Artificial Intelligence and Machine Learning Vol 2 No 3 (2025) https://doi.org/10.58723/ijaaiml.v2i3.567

Check for updates

Research Article

Chatbot for Traditional Malay Museum

Received: October 05, 2025	Revised: November 19, 2025	Accepted: November 28, 2025	Publish: November 30, 2025

Misinem*, Hafiz Muhammad Kurniawan, Fadly, Muhammad Raihan Hanif

Abstract:

Background of study: Museums play a key role in preserving cultural heritage and educating the public. In Malaysia and Indonesia, over 150 traditional Malay museums attract millions of visitors annually. Between 2015 and 2017, the Department of Museum Malaysia recorded 9.1 million visitors, while Indonesia reported over 12 million. Managing visitor inquiries manually poses challenges for museum staff, highlighting the need for an automated information system.

Aims: This study aims to develop a chatbot for Muzium Adat to provide instant, accurate, and accessible information to visitors, thereby reducing dependence on staff and enhancing the visitor experience.

Methods: A museum information chatbot was developed to answer frequently asked questions related to Muzium Adat. The system was tested through questionnaires distributed to 15 respondents to assess usability, accuracy, and satisfaction.

Result: Findings showed that the chatbot achieved an 83.6% satisfaction and accuracy rate, indicating effective real-time interaction and reliable responses.

Conclusion: The Muzium Adat chatbot improves communication efficiency, saves time, and enhances visitor engagement. It demonstrates the potential of chatbot technology to support museum operations and promote cultural heritage in Malaysia and Indonesia.

Keywords: Chatbot; Museum; Natural Language Processing; Text Processing; Traditional Museum.

1. INTRODUCTION

Museums are essential cultural institutions that preserve and showcase historical artefacts, art, and stories, offering visitors a window into the past (Rahman et al., 2023). Around the world, including Malaysia and Indonesia, museums play a crucial role in educating the public about local and global heritage. There are over 100 museums across these two countries, attracting millions of visitors, particularly on weekends and public holidays, among those with an interest in history and culture. International tourists visiting Malaysia and Indonesia often explore these museums to learn about Malay history, culture, and traditions. However, visitors frequently need more information before or after their museum visits, such as operational hours, entrance fees, and details about exhibits and artefacts.

Traditionally, museum visitors have contacted museum management or customer service via phone, email, or in-person visits to obtain such information. This approach often requires waiting for a response or scheduling an appointment, which can be time-consuming and inefficient. Between 2021 and 2025, the Department of Museums Malaysia reported 9 million museum visitors, while the Indonesian Tourism Department recorded over 12 million visitors to traditional Malay museums alone, comprising both local and international tourists (Department of Museums Malaysia, 2018; Resiyani, 2024). Given the high volume of visitors, museum staff often require assistance to respond promptly to every inquiry, which can impact the overall visitor experience (Vasiliki et al., 2020).

Chatbots are AI-powered tools that simulate human-like conversations and respond instantly to user queries (Nwokedi & Nwafor, 2024). Due to their simultaneous efficiency in handling a large volume of inquiries, they have become increasingly popular in various sectors, including customer service, healthcare, finance, and tourism. Chatbots can significantly improve the visitor experience in museums by providing instant access to essential information, such as opening hours, ticket prices, exhibit details, and more (Štekerová, 2022).

The benefits of Implementing Chatbots in museums include real-time responses (Varitimiadis et al., 2020). Chatbots can answer visitor questions immediately, reducing waiting times and enhancing visitor

satisfaction. Unlike human staff, chatbots are available around the clock, offering support to visitors at any time of day, even outside of regular museum hours. By automating routine inquiries, museums can reduce the need for extensive customer service teams, thus saving operational costs. Chatbots can be programmed to deliver customised responses based on visitor preferences and previous interactions, making the museum experience more engaging (Tzouganatou, 2018). Chatbots can collect valuable data on visitor interactions, enabling museums to understand visitor needs better, improve services, and tailor exhibits accordingly. Museums in multicultural countries, such as Malaysia and Indonesia, can benefit from chatbots that offer multilingual support, catering to both local and international visitors.

To address the challenges faced by museums in Malaysia and Indonesia, an intelligent chatbot system named "Muzium Adat" was developed. In Malay, "Adat" means traditional, reflecting the region's rich cultural heritage. The system is designed to assist museums in both countries by providing visitors with quick access to information about museum operations and exhibits.

Muzium Adat is designed with a simple, easy-to-navigate interface that can be accessed via smartphones, tablets, or desktop devices. The chatbot is integrated with museum databases to provide accurate and up-to-date information about operating hours, entry fees, exhibit descriptions, and more. Visitors can ask questions in natural language, and the chatbot provides answers based on a vast repository of museum data (Chai-arayalert et al., 2024). Muzium Adat can recommend exhibits tailored to visitor interests and guide them through their museum visit, thereby enhancing the overall experience (Wang & Matviienko, 2025). The chatbot collects visitors' input, helping museums continually improve their services and offerings (Putnina et al., 2025).

While the development of Muzium Adat offers significant benefits, implementing such technology poses challenges, including the need for robust data integration, continuous system updates, and training museum staff to oversee chatbot interactions (Mazzanti et al., 2025). Ensuring that the chatbot can handle complex inquiries and provide culturally sensitive responses is also crucial, given the diverse audience that visits museums in Malaysia and Indonesia.

Moving forward, integrating advanced AI technologies such as natural language processing (NLP) and machine learning can further enhance Muzium Adat's capabilities. The chatbot can improve its response accuracy by continuously learning from visitor interactions and providing more personalised and engaging experiences.

Implementing chatbot technology, such as Muzium Adat, represents a significant step towards modernising museum visitor management in Malaysia and Indonesia. By addressing the inefficiencies of traditional communication methods, chatbots can enhance the visitor experience, support museum operations, and ensure that these cultural institutions remain relevant and accessible in the digital age. As museums continue to evolve, embracing innovative solutions such as chatbots will be crucial in meeting the expectations of today's tech-savvy visitors and preserving the rich heritage of Malay culture for future generations.

Chatbot

Chatbots have been around since the 1950s, evolving significantly in complexity and application across various sectors, including commerce, education, the public sector, and entertainment (Caldarini et al., 2022). As defined by Kerly & Bull (2007), the structure and functionality of chatbots can vary widely depending on their intended purpose. In commerce, chatbots are often designed to assist with customer service, facilitate transactions, and provide product recommendations (Bilal et al., 2023). In education, they serve as virtual tutors or study companions, enhancing the learning experience (Davar et al., 2025). In the public sector, chatbots assist with administrative tasks, guide citizens through various services, and provide access to policy information (Larsen & Følstad, 2024). Entertainment chatbots engage users in conversations, storytelling, or games, enhancing user interaction.

(Siow et al., 2025) observed that chatbots transform the way people interact with online services, reshaping communication from traditional methods, such as email and phone calls, to more instant and conversational formats. This shift towards conversational AI reflects the growing demand for quick, personalised, and efficient service delivery. (Julianto et al., 2025) noted that various scripting languages and technologies are used to build chatbots, chosen based on each application's specific requirements and objectives. Modern chatbot development often integrates NLP, enabling chatbots to understand and respond to human language naturally. (Chao et al., 2021) further highlighted the importance of fusing NLP with ontology, a structured framework for knowledge representation that helps chatbots comprehend and process complex information during conversations. This combination enables chatbots to provide more contextually accurate and relevant responses, thereby enhancing their effectiveness.

Historical Evolution of Chatbots

The journey of chatbot development began in 1966 with Joseph Weizenbaum, who created the first known chatbot, ELIZA. ELIZA was a groundbreaking program that simulated a conversation between a user and a therapist, using pattern matching and scripted responses to emulate an understanding of user inputs. ELIZA's creation marked a significant milestone in artificial intelligence, demonstrating the potential of machines to engage in conversations that appear intelligent (Natale, 2018).

Following ELIZA's success, several other chatbots were developed, each building upon the technological foundation laid by its predecessors:

1. A.L.I.C.E. (Artificial Linguistic Internet Computer Entity): Developed in the mid-1990s by Richard Wallace, A.L.I.C.E. was a significant advancement from ELIZA. The Artificial Intelligence Markup Language (AIML) was used to manage conversation flow and improve response accuracy. A.L.I.C.E. won the Loebner Prize Turing Test three times, showcasing its effectiveness in human-computer interaction (Amin et al., 2023).
2. Jabberwacky: Created by Rollo Carpenter in the 1980s, Jabberwacky focused on entertainment and was designed to engage users in natural, conversational interactions. Unlike its predecessors, Jabberwacky employed a learning model that constantly evolved through user interactions to improve its responses (Singh & Thakur, 2020).
3. IBM Watson: Launched in the 2010s, IBM Watson represents a significant leap in chatbot technology. It leverages deep learning, NLP, and vast datasets to provide highly accurate answers across various fields. Watson gained fame for defeating human champions on the "Jeopardy!" quiz show and has since been applied to solve complex problems in healthcare, finance, customer service, and other industries (Alsheref & Fattoh, 2020).

As chatbot technology advances, integrating NLP, machine learning, and AI enables chatbots to become more human-like and capable of handling increasingly sophisticated tasks. Modern chatbots are not just tools for answering questions; they are becoming integral to customer service strategies, educational platforms, and personal assistants. The fusion of these technologies enables chatbots to understand user intent better, maintain context across interactions, and provide meaningful and personalised experiences (Rahman et al., 2023).

The historical trajectory from ELIZA to IBM Watson illustrates the rapid evolution of chatbots, driven by technological advancements and an increasing demand for efficient, interactive communication tools. As we explore new possibilities in AI and NLP, chatbots are poised to become even more versatile, transforming how we interact with technology in our everyday lives.

2. MATERIAL AND METHOD

The methodology for this research, as shown in Figure 1, which is a chatbot for Muzium Adat, requires nine phases: preliminary study, knowledge acquisition, knowledge representation, system design, observation, system development, system testing and evaluation, system validation, and documentation, each separated based on the research objectives' requirements

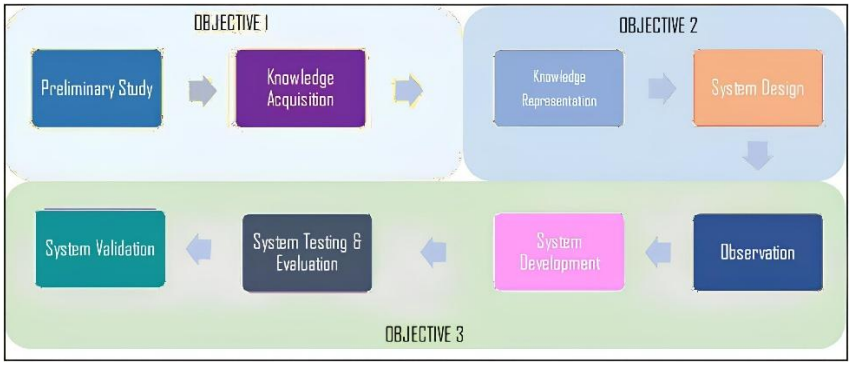

Figure 1. Phases for This Research

The data and information needed or related are collected during the preliminary study phase, which takes place in September, October, and November 2023. This can be done by reading and understanding the literature review. For this research, articles from past studies and research written by various researchers from around the world related to the research topic have been reviewed and summarised during the literature review.

The article can be found in online library databases such as Scopus, Google Scholar, ACM Digital Library, SAGE Research, and SAGE Journal. Then, after reviewing the articles, the objectives for this research are formulated. There are three objectives for this research, which are the first one is to design the main features needed by Muzium Adat visitors in real-time, then to represent the knowledge and information about Muzium Adat on a chatbot, and the last objective is to develop a chatbot that can act like a museum customer service person.

Based on data and information collected during the preliminary study and knowledge acquisition phase for this research, Muzium Adat, Negeri Sembilan, has a low number of visitors, which is affected by insufficient time management, inefficiency in museum customer service, and the management's response to questions or inquiries from museum visitors.

For this research, the method used to collect the data and related information about the project is understanding the literature, selecting articles taken from online databases and articles from Scopus, Google Scholar, ACM Digital Library, Academia.edu, SAGE Research, and SAGE Journal that have a similar focus, which is about chatbots for museums.

Based on those articles, the language used in each article will be appropriately analysed to understand the language and abstract the idea that seems suitable for implementation within this project. The main feature they aim to implement in their project or chatbot is to create games or gamify the chatbot. Their purpose is to attract more users, primarily focusing on teenagers, to utilise their chatbot to gain knowledge and information about museums or to provide knowledge about any aspect of the chosen museum.

Next, the second method will collect data and related information about this project by interviewing relevant persons from Muzium Adat, such as museum staff, customer service personnel, and management personnel.

Some initial or raw data were collected during this phase, such as the everyday questions asked by museum visitors to museum staff or museum management. Additionally, the artefacts and galleries in Muzium Adat were examined, and museum visitors asked six everyday questions about some artefacts, as shown in Figure 2.

Figure 2. Everyday Things Asked by Museum Visitors

This research will utilise various tools to ensure the project runs smoothly, including Telegram (Web, Windows, iOS, and Android-based), activechat.ai, and other natural language processing (NLP) tools.

Telegram is a cloud-based instant messaging app that allows users to send messages and multimedia, including audio, graphics, animations, videos, and more. This software also provides Voice-Over IP (VoIP) service, allowing users to make phone or video calls using these apps and software. It is available for Android, iOS, Windows Phone, Windows NT, macOS, and Linux. Telegram has been chosen for implementation in this project, the Chatbot for Muzium Adat, because it is an open-source software that many users frequently use and install on their smartphones, as well as on computers and laptops.

Telegram recorded around 200 million active users using this software monthly, which can be downloaded for free without any payment. This software or app also provides APIs to independent developers at no cost, making it easier for this project to be implemented with Telegram, as shown in Figure 3.

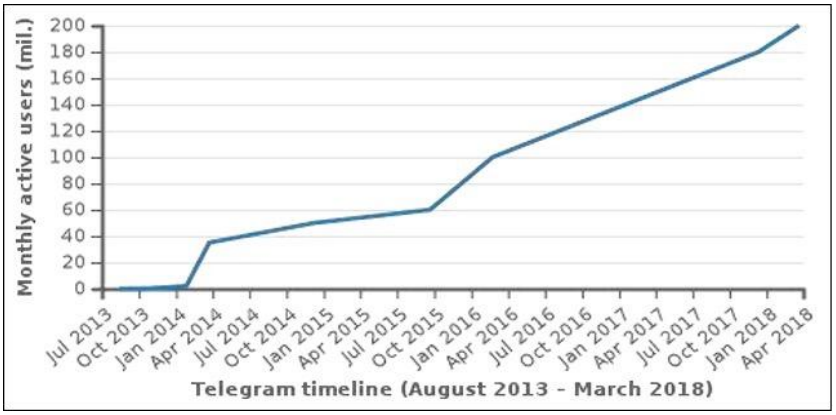

Figure 3. The Monthly Active User Using Telegram

ActiveChat.ai is a third-party software that is an intelligent conversational Artificial Intelligence platform with natural language (NLP) understanding for customer support, e-commerce, and marketing chatbots (Chintalapudi et al., 2025). It is a paid software, but it's free if the number of users who visit and use the chatbot created with this software does not exceed 500 users. This software enables them to integrate their chatbot through APIs with various services, including Telegram, Facebook Messenger, and many more. Below in Figure 4 is a screenshot of the initial progress and flow of the Chatbot for the Traditional Muzium on ActiveChat.ai

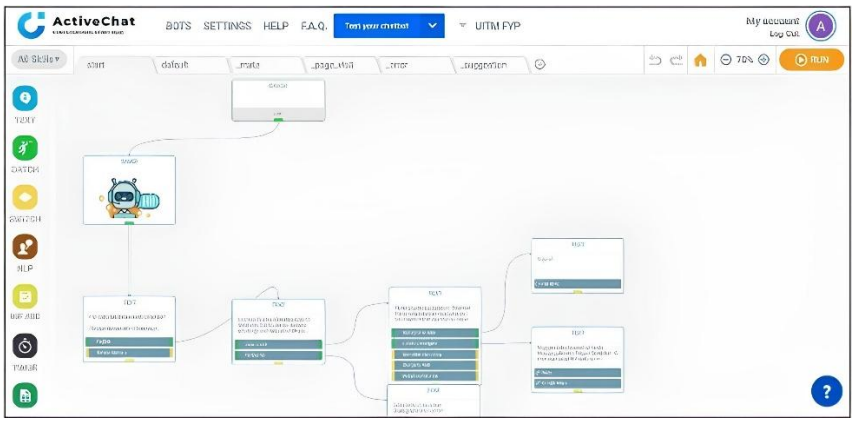

Figure 4. Initial Progress and Flow of Chatbot for Traditional Muzium on Activechat.Ai

Dialogflow is third-party software made by Google. It is one of many natural language processing (NLP) platforms that can assign and understand natural language (Abdelmoiz et al., 2024). This software typically designs and implements a user interface for any supported device or platform, such as smartphones, websites, bots, and intelligent systems. Figure 10 below is a screenshot of the Muzium Adat chatbot on Dialogflow, as shown in Figure 5.

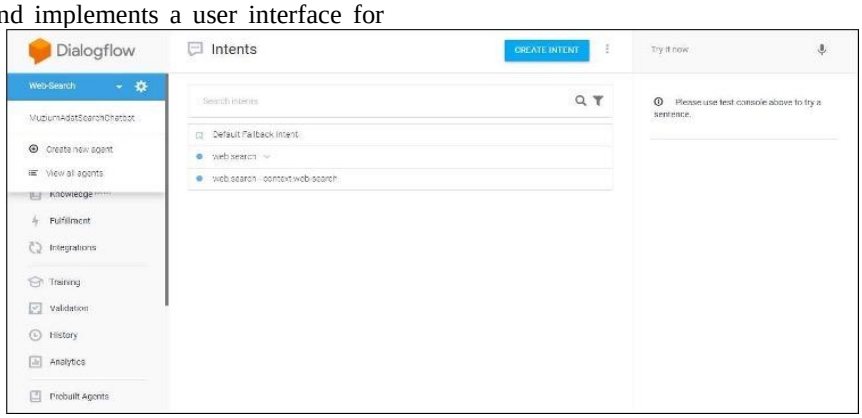

Figure 5. Traditional Muzium Chatbot Implementation on Dialogflow

Figure 6 below is an initial flow chart of how the chatbot for this project should react when users ask questions.

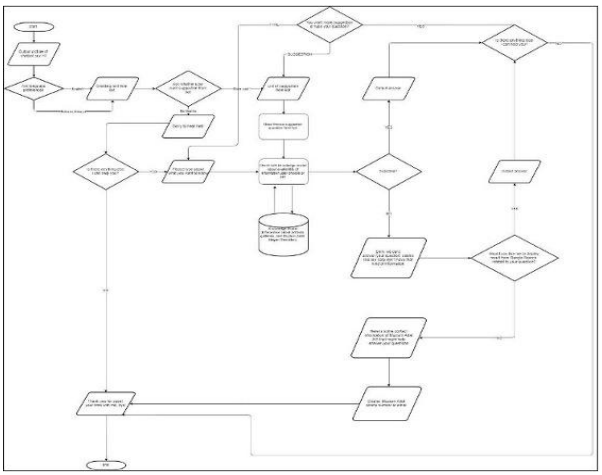

Figure 6. Flowchart of Chatbot for Traditional Malaysian and Indonesian Museums.

A knowledge model is a set of related data and information that will be collected for this project. Associated data and information were listed in table form. Table 1 below presents data and information collected during Phase 2 of the research method, specifically, knowledge acquisition.

Tabel 1. Knowledge Model of Chatbot for Traditional Malaysian and Indonesian Museums

Scope	Related data / Information
Muzium Adat	History
	Location
	Operation hour
	Contact information
	Museum's website
	Rate or charge per enter
	Number of artifacts
	Number of galleries
Artifacts	History
	Name of artifacts
	Origin of artifacts (where it comes from?)
	Picture of each artifact
Gallery	Gallery Ground Floor – Introduction of Adat
	Gallery Level One – Life Cycle
	Gallery Level Tow – Intellectual Tradition / Government and Power
	Gallery Level Three – Traditional Heritage
	Picture of each gallery

In this phase, to satisfy the seventh phase of the research method, system testing and evaluation, the chatbot will be tested to ensure it can respond to user questions and inquiries. Feedback from several users will also be taken and recorded to ensure the chatbot is functioning well.

The knowledge model of a chatbot designed for traditional Malaysian and Indonesian museums, specifically Muzium Adat, encompasses a structured scope of information that aims to enhance visitor engagement and improve access to essential museum-related details. The chatbot's knowledge base is organised into three main categories: Muzium Adat, Artefacts, and Galleries, each providing comprehensive data and information relevant to the museum experience.

Muzium Adat Scope

The Muzium Adat category provides visitors with fundamental information about the museum. This includes the museum's history, location, operating hours, contact information, website, entry rates, the number of artefacts, and galleries. The chatbot serves as a virtual guide by offering these details, helping visitors plan their visits more effectively. For example, knowing the operation hours and location helps visitors schedule their trips (Sathiyabamavathy & P, 2024). At the same time, information about entry fees and contact details allows them to make informed decisions and reach out if further assistance is needed. This scope also includes information on the number of artefacts and galleries, which gives visitors an overview of the museum's size and the depth of its collection. This feature is handy for those who wish to explore specific themes or sections within the museum.

Artifacts Scope

The Artefacts category provides detailed insights into the individual pieces housed within the museum. This includes the history of each artefact, its name, and its origin, enhancing the visitor's understanding of the cultural and historical significance of the displayed items. Pictures of each artefact are also included, enriching the visitor's visual experience and serving as a tool for remote engagement, allowing those who cannot physically visit the museum to explore the collection virtually. This information is crucial for educating visitors about the diverse cultural heritage represented by the artefacts. For example, learning about an artefact's origin and seeing its image helps contextualise its place within Malaysian and Indonesian history, thus fostering a deeper appreciation of the region's cultural legacy.

Gallery Scope

The Gallery category organises the museum's content into distinct thematic areas across multiple floors. Each gallery represents a different aspect of traditional Malay culture and history, structured as follows:

1. Ground Floor. Introduction to Adat: This section serves as an introductory space, providing visitors with a foundational understanding of traditional customs (Adat).
2. Level One. Life Cycle: This course explores the stages of human life and their associated traditional customs, offering a cultural narrative that spans from birth to death.
3. Level Two. Intellectual Tradition / Government and Power: This section highlights the intellectual heritage, governance systems, and the role of

power in traditional societies, offering insights into the historical structures that shaped the region.

4. Level Three. Traditional Heritage showcases a broader array of cultural artefacts, emphasising the preservation and continuation of traditional heritage.

Including images of each gallery enhances the chatbot's ability to guide visitors through the museum visually, creating a more engaging and interactive experience. The clear separation of content across different gallery levels helps visitors navigate the museum in an organised manner, aligning their exploration with their specific interests.

The chatbot for Muzium Adat offers a comprehensive and organised knowledge base designed to improve visitor interaction with traditional Malaysian and Indonesian museums. By providing detailed information about the museum, artefacts, and galleries, a chatbot is a valuable tool for both in-person and virtual visitors. This model facilitates access to essential information and enriches the educational experience by offering historical context, visual aids, and easy navigation through the museum's diverse offerings. Ultimately, the chatbot aims to enhance the visitor experience, making museum exploration more accessible, informative, and engaging.

3. RESULT AND DISCUSSION

3.1 Results

Several server-side technologies, including Telegram, ActiveChat.ai, and Dialogflow, have been utilised to develop a chatbot for this project. These technologies have been connected to display results or output from a chatbot. The project system architecture illustrates the connection between all technologies, users, and chatbots, as depicted in Figure 7.

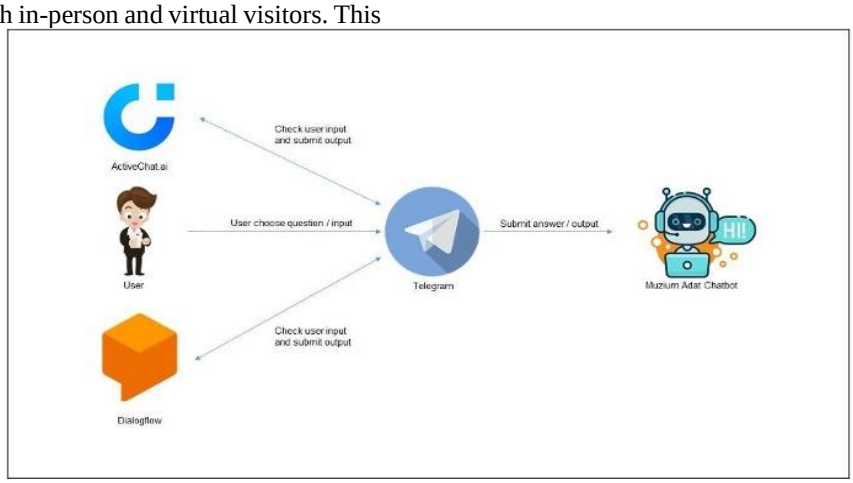

Figure 7. Project System Architecture

The process between Telegram and Muzium Adat is straightforward. After Telegram checks the inquiries, the chatbot's display output will be based on matched intents or error messages. Telegram will be sent to determine whether there is any matched intent, and the chatbot will respond based on the output from the trigonal process between Telegram, ActiveChat.ai, and Dialogflow. Figures 8 through 15 provide a more detailed explanation of chatbot responses.

Figure 8. First page of Muzium Adat chatbot

Figure 9. The chatbot introduces itself and asks about language preferences

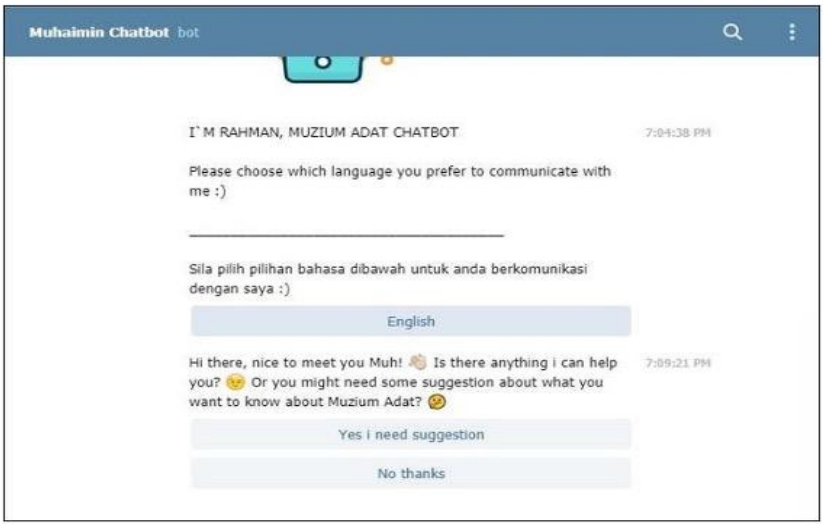

Figure 10. Chatbot greeting the user

Figure 11. Suggestions by Muzium Adat Chatbot

Figure 12. Muzium Adat chatbot catches user attention in the middle of an explanation

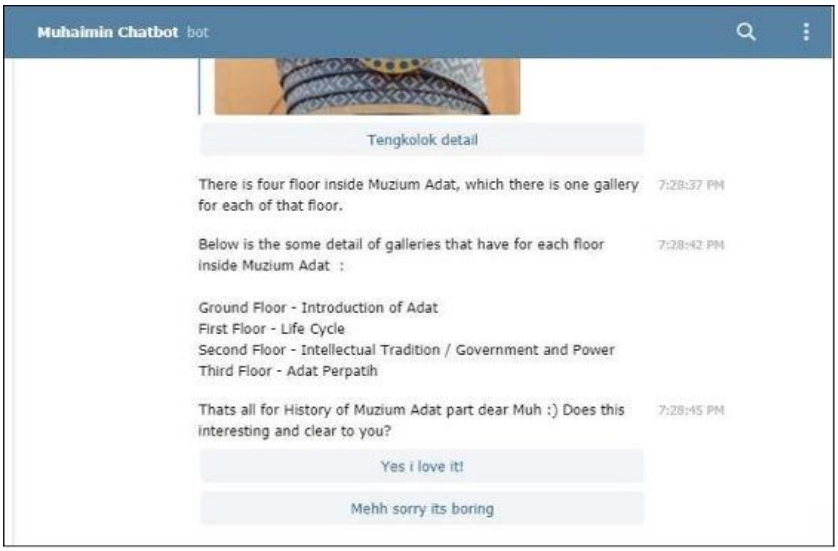

Figure 13. Muzium Adat chatbot catches the user's attention at the end of the explanation

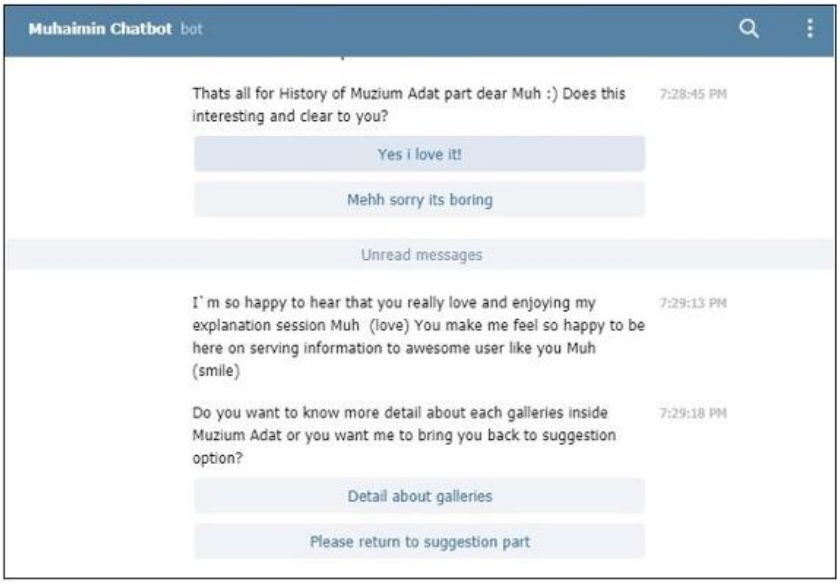

Figure 14. The chatbot asks users whether they want to return to the suggestion list.

A message indicating that the chatbot is typing will appear at the top of the Telegram app or between user-chatbot conversations.

Figure 15. Chatbot is typing messages.

Research for this project has been conducted. Questionnaires have been documented using the Google Form platform and distributed to some users. The questionnaire consists of 13 questions, 10 of which will be used to calculate the chatbot's accuracy, as shown in Figures 16-19.

Basic personal information

1. User name (optional)
2. Name of device used to run chatbot
3. Frequently of running the chatbot on their devices

Questionaires (Rating from 1 to 5)

1. The chatbot feedback or responses related to your questions and selected inquiries in real time?
2. Does the chatbot can display error messages or response when there is problems on responsing your selected inquiries?
3. Does the chatbot response with proper and fast in real time?
4. Do you feel lose when chatbot responsing on explain the information you need? Does the chatbot catch-up with your attention?
5. Do this chatbot help you to get more information about Muzium Adat with ease?
6. Do you feel like this chatbot response like how other museum staff in person will response? Identical to human responses?
7. Do you find chatbot style on explaining information is interesting?
8. Do you interested to visit Muzium Adat after use this chatbot?
9. Does this chatbot help you navigate to Muzium Adat accurately?
10. Do you satisfy and happy with this chatbot?

Figure 16. Questions inside questionnaires

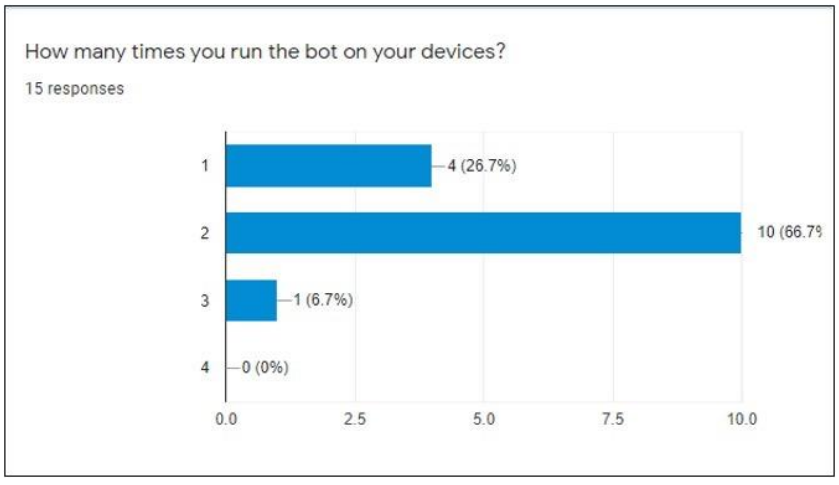

Figure 17. Questionnaire result

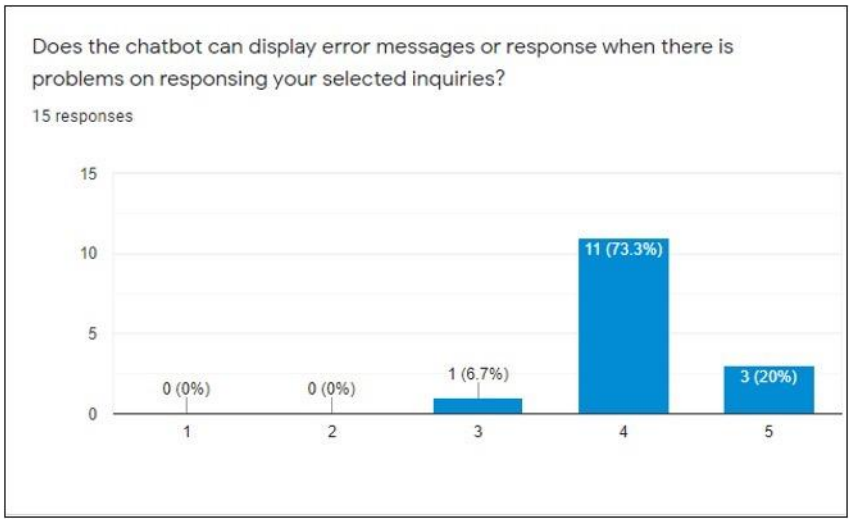

Figure 18. Questionnaire result

User	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	TOTAL, Tf	TOTAL % each user
1	5	5	4	5	5	4	5	4	5	5	47	94
2	3	4	4	4	4	4	4	4	4	4	39	78
3	4	3	3	4	4	3	4	4	4	4	37	74
4	4	4	5	4	5	4	4	4	4	4	42	84
5	4	4	4	4	4	3	3	4	3	4	37	74
6	3	4	4	3	4	4	4	4	4	4	38	76
7	4	4	4	4	4	4	4	4	4	4	40	80
8	4	4	4	4	4	4	4	4	4	4	40	80
9	4	4	4	3	4	4	3	4	4	4	38	76
10	4	4	4	4	5	4	4	5	5	5	44	88
11	5	5	5	5	5	4	5	5	5	5	49	98
12	5	4	5	4	5	2	4	4	4	5	42	84
13	4	4	4	4	4	4	5	5	5	4	43	86
14	5	5	5	4	5	4	5	5	5	5	48	96
15	5	4	5	5	4	3	4	4	4	5	43	86
											Total Tf = 627	83.6

Figure 19. Table of Full results of questionnaires answered by 15 respondents

All results and findings in this chapter, including those from the system architecture itself, were explained in detail regarding how the Muzium Adat chatbot works and responds. On chatbot activity, it describes how chatbots respond to user-selected inquiries in real-time.

The accuracy of the system and the chatbot's deliverables are also explained by showing the questionnaire datasets. All that data is calculated using an equation or formula to determine the percentage of chatbot accuracy. The project's significance has also been demonstrated by the results of the questionnaires, which 15 respondents completed, and most of them expressed satisfaction with this chatbot system.

3.2 Discussion

The results of the study show that chatbots for traditional museums can help overcome the problem of conveying information in traditional Malay museums. These chatbots work well with Telegram, ActiveChat.ai, and Dialogflow to enable people to interact with each other and respond to visitors' questions automatically. With an accuracy and satisfaction rate of 83.6%, this system can answer frequently asked questions about museum information, artifacts, and galleries. These results show that chatbots can make visitors more engaged and reduce their dependence on museum staff for common questions.

3.2.1 Implications

The Traditional Museum Chatbot can have a significant impact on visitor services and museum management.

1. Chatbots lighten the workload of museum staff, allowing them to concentrate on more complex or strategic tasks and improve communication so that visitors do not have to wait long.
2. Chatbots improve operational efficiency by providing instant responses, minimizing visitor wait times.
3. Chatbots are accessible to many users, both domestically and internationally, as they are available on popular platforms such as Telegram. This demonstrates that chatbots can be a scalable digital solution for cultural institutions seeking to transform visitor engagement and disseminate information.

3.2.2 Research contribution

This study expands knowledge about the use of chatbots and AI in the fields of cultural heritage and tourism. This research provides a practical application model for traditional museums in Malaysia and Indonesia. This differs from previous studies, which have mostly focused on educational or commercial chatbots. A structured knowledge model using data from museums, galleries, and artifacts shows how chatbots can effectively display cultural content. In addition, this study is more practically relevant because the empirical evaluation conducted through user questionnaires provides quantitative evidence of chatbot accuracy and user satisfaction.

3.2.3 Limitations

This study has several limitations despite its positive results. The number of participants asked for evaluation was limited to 15 users; therefore, they may not fully represent all people who visit the museum. In addition, chatbots may not be able to answer complex or highly contextual questions because they typically handle predefined and frequently asked questions. The system's performance also depends on the completeness and quality of the knowledge base, which must be updated regularly to maintain its accuracy. These limitations indicate that chatbots can only convey basic information.

3.2.4 Suggestions

Further research should involve a more diverse population to obtain a broader picture of user satisfaction and system performance. Using advanced machine learning techniques, chatbots can learn from user interactions and gradually improve their responses. In addition, multilingual support and voice-based interactions can improve accessibility for visitors from around the world. Furthermore, adding chatbots to interactive features such as virtual tours or learning quizzes can also increase visitor engagement and learning outcomes.

4. CONCLUSION

The research on developing the 'Muzium Adat' chatbot for traditional Malay museums represents a significant advancement in enhancing visitor engagement through technology, and implementing this AI-driven chatbot aimed to address the high demand for museum information and improve the efficiency of museum interactions.

The results of this initiative were highly encouraging. The chatbot achieved a commendable accuracy rate of 83.6%, indicating its effectiveness in providing reliable and timely information to museum visitors. This level of performance underscores the chatbot's ability to handle a vast range of visitor inquiries with precision, reflecting well on the underlying technology and the thoughtful design of its knowledge base.

Moreover, the chatbot's impact extended beyond just visitor interaction. It demonstrated potential in streamlining operations, reducing the workload on museum staff, and enhancing the overall visitor experience by offering quick and accessible information. This innovation supported the operational aspects of museum management and enriched the educational experience for visitors by ensuring they had immediate access to comprehensive and accurate museum-related information.

The 'Muzium Adat' chatbot project was a resounding success. It showcased how integrating AI technology in cultural institutions could significantly improve visitor satisfaction and operational efficiency. The chatbot's positive reception and high accuracy promise a more engaged and informed future for museum visitors, paving the way for further innovations in the museum sector.

5. ACKNOWLEDGEMENT

The authors would like to thank the management and staff of the Museum Adat for their cooperation and assistance during the data collection and system development process. In addition, we would like to thank everyone who filled out the questionnaire and provided useful feedback for the chatbot system evaluation. The authors would also like to thank all the individuals and institutions who contributed to the success of this project, both directly and indirectly.

6. AUTHOR CONTRIBUTION STATEMENT

M conceptualized and designed the research, supervised the project implementation, and provided critical review and revision of the manuscript. HMK performed data collection, system design, chatbot implementation, experimental validation, and prepared the initial draft of the manuscript and performed statistical and usability analyses. F and MRH provided additional information, assisted with the knowledge model, data validation, and questionnaire development. All authors collaboratively interpreted the results, refined the discussion, and approved the final version of the manuscript for publication.

AUTHOR INFORMATION

Corresponding Authors

Misinem, Universitas Bina Darma, Palembang, Indonesia
https://orcid.org/0000-0002-7946-4582
Email: misinem@binadarma.ac.id

Authors

Hafiz Muhammad Kurniawan, INTI International University, Malaysia
https://orcid.org/0009-0007-5069-0811
Email: kurni.hafiz2002@gmail.com

Fadly, Politeknik Kesehatan Kemenkes Palembang, Indonesia
https://orcid.org/0009-0007-7495-2046
Email: fadly@poltekkespalembang.ac.id

Muhammad Raihan Hanif, Madrasah Aliyah Negeri Insan Cendekia Ogan Komering Ilir, Indonesia
https://orcid.org/0009-0003-4960-7604
Email: muhammadraihanhanif2008@gmail.com

REFFERENCE

Abdelmoiz, M. M. A., Mostafa, M. M. M., & Soliman, T. H. A. (2024). Developing an Educational Chatbot for Scientific Data Management Course Using DialogFlow. *Applied Mathematics & Information Sciences*, *640*(3), 629–640. https://doi.org/10.18576/amis/180315

Alsheref, F. K., & Fattoh, ibrahim E. (2020). Medical Text Annotation Tool based on IBM Watson Platform Fahad. *2020 6th International Conference on Advanced Computing & Communication Systems (ICACCS)*, 1312–1316. https://doi.org/10.1109/ICACCS48705.2020.9074309

Amin, M., Nazik, K., & Salwa, A. (2023). Interacting with educational chatbots : A systematic review. In *Education and Information Technologies*. Springer US. https://doi.org/10.1007/s10639-022-11177-3

Bilal, M., Jamil, A., Shahzadi, D., Aslam, M., & Ahmad, T. (2023). A Conversational Interface Agent for the Export Business Acceleration : A Systematic Review. *Lahore Garrison University Research Journal of Computer Science and Information Technology*, *7*(2), 15–28. https://doi.org/10.54692/lgurjcsit.2023.0702430

Caldarini, G., Jaf, S., & McGarry, K. (2022). A Literature Survey of Recent Advances in Chatbots. *Information*, *13*(1), 41. https://doi.org/10.3390/info13010041

Chai-arayalert, S., Puttinaovarat, S., & Saetang, W. (2024). Chatbot-mediated technology to enhance experiences in historical textile museums. *Cogent Arts & Humanities*, *11*(1). https://doi.org/10.1080/23311983.2024.2396206

Chao, M., Trappey, A. J. C., & Wu, C. (2021). Emerging Technologies of Natural Language-Enabled Chatbots : A Review and Trend Forecast Using Intelligent Ontology Extraction and Patent Analytics. *Complexity*, *2021*, 1–26. https://doi.org/10.1155/2021/5511866

Chintalapudi, S. M., El-Gayar, O., & Noteboom, C. (2025). A systematic literature review on AI chatbots in automating customer support for e-commerce. *Issues in Information Systems*, *26*(1), 403–417. https://doi.org/10.48009/1_iis_130 A

Department of Museums Malaysia. (2018). Open data. http://www.jmm.gov.my/en/content/open-data

Davar, N. F., Dewan, M. A. A., & Zhang, X. (2025). AI Chatbots in Education : Challenges and Opportunities. *Information*, *16*(3), 235. https://doi.org/10.3390/info16030235

Julianto, R., Gunawan, T., & Apriadi, E. A. (2025). Development of an Intelligent Educational Chatbot Using NLP and Machine Learning. *International Journal of Technology and Computer Science*, *1*(1), 14–24. https://doi.org/10.58290/ijtcs.v1i1.156

Larsen, A. G., & Følstad, A. (2024). The impact of chatbots on public service provision : A qualitative interview study with citizens and public service providers. *Government Information Quarterly*, *41*(March 2023). https://doi.org/10.1016/j.giq.2024.101927

Mazzanti, P., Ferracani, A., Bertini, M., & Principi, F. (2025). Reshaping Museum Experiences with AI : The ReInHerit Toolkit. *Heritage*, *8*(7), 277. https://doi.org/10.3390/heritage8070277

Natale, S. (2018). If software is narrative : Joseph Weizenbaum , artificial intelligence and the biographies of ELIZA. *New Media & Society*, *21*(3), 1–17. https://doi.org/10.1177/1461444818804980

Nwokedi, C. C., & Nwafor, C. A. (2024). Enhancing customer service and user experience through the use of machine learning powered intelligent chatbots. *World Journal of Advanced Research and Reviews*, *23*(2), 181–191. https://doi.org/10.30574/wjarr.2024.23.2.2307

Putnina, Z., Decrop, J., Iris, E., & Simon, V. D. T. (2025). Evaluating the ArtBot Guide : A Toolkit for Enhancing Engagement with Digitized Museum Collections. *Digital Society*, *4*(66), 1–34. https://doi.org/10.1007/s44206-025-00222-6

Rahman, R. A., Ramadan, D. N., Hadiyoso, S., Maidin, S. S., Irawati, I. D., & Author, C. (2023). A SMART KUMBUNG FOR MONITORING AND CONTROLLING ENVIRONMENT IN OYSTER MUSHROOM CULTIVATION BASED ON. *Journal of Applied Engineering and Technological Science*, *5*(1), 245–257. https://doi.org/10.37385/jaets.v5i1.2248

Resiyani, W. (2024). Potensi Penerapan Open Air Museum di Kawasan Pulau Penyengat Kepulauan Riau dalam Upaya Pengembangan Pariwisata Daerah. *INNOVATIVE: Journal Of Social Science Research*, *4*(4), 6207–6219. https://doi.org/10.31004/innovative.v4i4.13854

Sathiyabamavathy, K., & P, A. K. (2024). Role of Chatbots in Cultural Heritage Tourism : An Empirical Study on Ancient Forts and Palaces. *Journal of Heritage Management*, *9*(19–28). https://doi.org/10.1177/24559296241253932

Singh, S., & Thakur, H. K. (2020). Survey of Various AI Chatbots Based on Technology Used. *2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)*, 1074–1079. https://doi.org/10.1109/ICRITO48877.2020.9197943

Siow, J. S., Teoh, B. A., Ong, C. Z., & Chee, K. X. (2025). The impact of AI chatbot adoption on customer experience in e-retailing. *Issues and Perspectives in Business and Social Sciences*, *5*(1), 27–37. https://doi.org/10.33093/ipbss.2025.5.1.3

Štekerová, K. (2022). Chatbots in Museums : Is Visitor Experience Measured ? *Czech Journal of Tourism*, *11*(1–2), 14–32. https://doi.org/10.2478/cjot-2022-0002.Abstract

Tzouganatou, A. (2018). Can Heritage Bots Thrive ? Toward Future Engagement in Cultural Heritage. *Advances in Archaeological Practice*, *6*(4), 377–383. https://doi.org/10.1017/aap.2018.32

Varitimiadis, S., Kotis, K., A, S. A. T., Tsekouras, G., & Spiliotopoulos, D. (2020). Towards implementing an AI chatbot platform for museums. *International Conference on Cultural Informatics Communication & Media Studies*, *1*(1), 1–15. https://doi.org/10.12681/cicms.2732

Vasiliki, D., Maria, V., Christina, B., & Leonindas, H. (2020). Service quality , visitor satisfaction and future behavior in the museum sector. *Journal of Tourism, Heritage & Services Marketing*, *6*(1), 3–8. https://doi.org/10.5281/zenodo.3603167

Wang, H., & Matviienko, A. (2025). Experiencing Art Museum with a Generative Artificial Intelligence Chatbot. *Conference: IMX '25: ACM International Conference on Interactive Media Experiences*, 430–436. https://doi.org/10.1145/3706370.3731650