

Revolutionizing Journal Publishing: Unleashing The Power Of Web-Based Chatbot Development With Dialogflow And Natural Language Processing

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Abstract.

The chatbot is a manifestation of Artificial Intelligence that can replace humans in engaging in conversational interactions and providing information services to users or visitors. Chatbots generally interact through text messages, voice, images, and other mediums. In this study, a web-based chatbot application was developed for a journal website called the *Journal of Multidisciplinary Issues*, aiming to relieve site administrators from having to repeatedly answer the same visitor questions. The development of the chatbot application followed the Rapid Application Development method, involving several stages including planning, design, system development, implementation, and testing. The application was built using Google Dialogflow services, employing Natural Language Processing techniques, along with the integration feature called Dialogflow Messenger, which offers a wide range of response options for journal websites utilizing Open Journal Systems. The chatbot application was evaluated using Alpha and Closed Beta Testing methodologies, which yielded promising results. The chatbot demonstrated the ability to provide appropriate responses after being tested with various question scenarios, achieving a score of 85.25% in the questionnaire-based assessment, which aimed to gauge visitor perspectives on the developed chatbot application. Future research endeavors should focus on integrating the chatbot with popular social media platforms such as Facebook, WhatsApp, or LINE.

Keywords: Chatbot, Google Dialogflow, Journal site, Rapid Application Development and Dialogflow Messenger.

I. INTRODUCTION

The rapid development of technology and information systems in recent years has had a profound impact on various aspects of business industries and human life. Notably, Artificial Intelligence (AI) has emerged as a prominent field, playing a pivotal role in this progress. AI involves computer systems that possess human-like intelligence, capable of performing tasks traditionally undertaken by humans, and, in some cases, even replacing them [1]. One specific area where AI technology has the potential to replace human labor is in the provision of information services through the utilization of AI systems known as chatbots. Chatbots are AI applications that employ Natural Language Processing (NLP) capabilities to facilitate communication between humans and machines, delivering informative messages and engaging in conversations using natural language [2]. While chatbots typically interact with users through text-based messages, advancements in technology have enabled interactions through voice messages, images, videos, and document sharing as well [3]. The increasing adoption of chatbots [20] can be attributed to the proliferation of service providers offering chatbot solutions with diverse features and easy implementation options, including renowned platforms like Google Dialogflow, Amazon Lex, Azure Bot, and others. To gauge the popularity and acceptance of chatbots, Fig. 1 presents the search trend for chatbots on the Google search engine from 2004 to 2021, revealing substantial growth since 2017 [4]. The data used for this analysis was obtained from the Google Trends service.

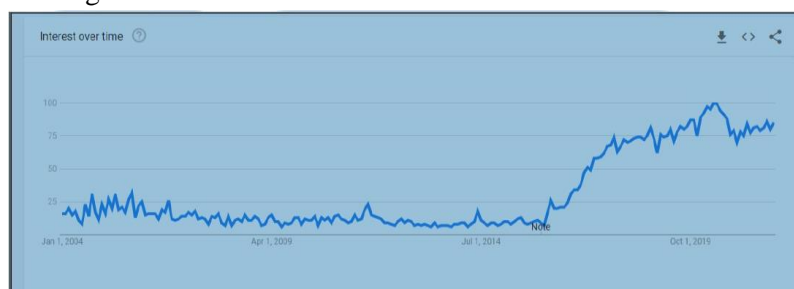


Fig 1. Chatbot Search Trends from Google Trends 2004-2021

This rising trend in chatbot usage presents opportunities for implementing chatbot systems across various domains, including the fields of education and research journals[5][6]. Online research journal platforms host a plethora of articles covering diverse disciplines, providing extensive information resources[7]. In Indonesia, the Jurnal SINTA (Science and Technology Index) platform (<https://sinta.kemdikbud.go.id/journals>) serves as a website and portal managed by the Ministry of Education, Culture, Research, and Technology. It features a comprehensive list of nationally accredited journals. In this study, an observation was conducted on research journals available on the SINTA-1 and SINTA-2 websites[10]. The observation focused on 10 journals indexed in SINTA-1 and 5 journals indexed in SINTA-2. Surprisingly, no information service utilizing a Chatbot system was found during the observation. This suggests that the implementation of Chatbot applications on journal websites is relatively new. By introducing a Chatbot feature that can assist users in searching for journal articles, providing information on journal submission guidelines, citation methods, and other relevant topics, journal website administrators can effectively address frequently asked questions from visitors[10].

The introduction of a Chatbot system holds promise in facilitating user engagement and enhancing the overall user experience[9]. The interactive nature of Chatbots allows visitors to obtain quick and accurate responses to their queries, reducing the need for manual assistance and streamlining the information retrieval process. By leveraging Chatbot technology, journal website administrators can efficiently address repeated inquiries and dedicate more time to other crucial tasks[9]. Moreover, the integration of a Chatbot feature can enhance the accessibility of journal websites, especially for users who are less familiar with traditional search methods or are seeking immediate assistance[9]. Chatbots can serve as virtual assistants, guiding users through the various functionalities of the website, offering recommendations, and providing real-time support[9]. This user-friendly approach can significantly improve user satisfaction and encourage continued engagement with the journal platform. The observation of research journals on the SINTA-1 and SINTA-2 websites revealed a notable absence of Chatbot services[8]. The introduction of a Chatbot application on journal websites represents a novel and promising approach to improve user experience and provide efficient support.

By incorporating a Chatbot system, journal website administrators can alleviate the burden of repetitive inquiries, enhance accessibility, and create a more engaging and user-friendly platform. The objective of this study is to develop and implement an English language Chatbot application using Google Dialogflow services, which utilizes Natural Language Processing methods[8]. The purpose is to create an automated information service that can assist in answering visitor inquiries on the journal website. The implementation of this Chatbot application aims to alleviate the burden on the administrators of the JMIS website by reducing the need to repeatedly respond to visitor questions via email. Instead, the Chatbot can provide more interactive and informative responses. This research is expected to provide benefits by facilitating the provision of information to site visitors. By eliminating the need to repeatedly answer the same visitor questions, the Chatbot application streamlines the process of delivering information[11]. The automated response capability of the Chatbot application is anticipated to benefit visitors by providing them with convenient access to journal-related information[11]. This ease of access enhances the overall user experience. Furthermore, this research aims to contribute to future studies by offering insights into the implementation of an English language Chatbot application using Google Dialogflow services[11]. It serves as a valuable reference for researchers interested in similar implementations.

II. METHODS

Overview of the Research Object

The Journal of Multidisciplinary Issues (JMIS) website is a platform that hosts a collection of articles focused on various fields such as Information Technology, Data Science, Information Systems, and others [16]. This journal also provides direct open access to its research articles, as it adheres to the principle that making research freely available to the public can support greater access and exchange of global knowledge. In terms of publication frequency, JMIS releases its journal volumes on a quarterly basis, specifically in the months of February, May, August, and November. The scope of JMIS focuses on the

theory, methodology, and implementation of emerging technologies and media. The journal covers a wide range of topics, including but not limited to technology and information, psychology, environmental science, data science, language and linguistics, education, sensor data and networks, information systems, gamification, and Health Sciences [17].

The software development method used in this research is called Rapid Application Development. The stages carried out in this research are as follows:

1. Literature study: Conducting a review of relevant literature.
2. Requirements planning: Planning and defining the requirements of the system.
3. System design: Designing the system based on the defined requirements.
4. System development: Developing the system according to the design.
5. Implementation: Deploying and integrating the developed system.
6. System testing: Additional stage to test the Chatbot application that has been created and deployed on the journal website.

In the Literature Study phase, journal articles discussing the creation of Chatbot applications and the technologies or frameworks used in their development were searched for [12]. This stage involved reading journal articles that specifically focused on the use of Google Dialog Flow in creating Chatbot applications. Additionally, books and documentation guides provided by Google Dialog Flow were studied to understand the creation and functioning of Chatbot applications using their service. In the Requirements Planning stage, observation was conducted on several SINTA-1 and SINTA-2 journal websites to determine whether Chatbot applications as information services had been implemented previously [12]. The research object was the Journal of Multidisciplinary Issues website, and information such as published journal articles, the number of issues and volumes, and other relevant data were observed. Interviews were also conducted with the website's owners, including Ms. Elfindah Princess as the Editor-in-Chief and Mr. Christian as one of the editors. During the interviews, the application's flow and desired features were planned [12]. The System Design stage involved creating a system design using Unified Modeling Language (UML) diagrams, including Use Case Diagrams, Class Diagrams, and Activity Diagrams. Additionally, interface design drafts for the Chatbot application, which would later be integrated into the journal website, were created.

The System Development stage focused on building the Chatbot application using the Google Dialog Flow service, specifically the Dialogflow ES Trial Edition. This included creating Agents, Intents, Contexts, adding Training Phrases for various user queries, defining response types, and building new pages in PHP and Bootstrap 5 to display journal articles based on categories, latest articles, and most viewed articles. In the Implementation stage, the Chatbot application was integrated into the Journal of Multidisciplinary Issues website using Dialogflow Messenger [12]. This involved placing the Chatbot widget in the website's Header and Footer sections to allow users to interact with and test the application. The Testing stage encompassed two methods: Alpha Testing and Closed Beta Testing [13]. The goal was to ensure that the Chatbot application provided accurate and appropriate responses to user queries. Feedback and perspectives from real users who participated in the testing process were also gathered [13]. The researcher collects primary data by conducting interviews with the Chief Editor of the Journal of Multidisciplinary Issues website. Secondary data consists of a collection of journal articles registered on the website, which will be included in the research project's database. Additionally, observation was conducted on website to gather important information that can be incorporated into Intents as conversation topics. To analyze the data collected from the application testing, specifically using the Closed Beta Testing method with a questionnaire using the Likert Scale, the Likert Scale was used to analyze the respondents' feedback on the performance of the chatbot system. The scale ranges from 1 to 5, indicating responses from negative to positive. Table 1 provides an explanation of the Likert Scale scores:

Table 1. Interpretation of Likert Scale Scores

Score	Description	Percentage
1	Strongly disagree	20%
2	Disagree	40%
3	Neutral	60%

4	Agree	80%
5	Strongly agree	100%

III. RESULT AND DISCUSSION

Requirement Planning Phase

In this phase, an analysis of the requirements for the chatbot system to be developed has been conducted in order to ensure that the system has features that meet the needs[14]. Interviews were conducted and during these interviews, discussions were held regarding the objectives of developing a chatbot application for the journal website, as well as the flow of conversation and the specific question types and corresponding answers that would be implemented in the chatbot system[14]. The results of the interviews indicated that both of them requested the chatbot application to be in English and to have an administrator page that allows for modifying or adding questions and answers without the need for technical knowledge such as coding. To fulfill this requirement, it was decided to use the Google Dialogflow service[14]. The features and conversation flow of the chatbot application, as discussed, can be seen in Figure 2. Furthermore, it was observed that visitors who have questions that are not registered in the Chatbot can provide feedback through Google Forms.

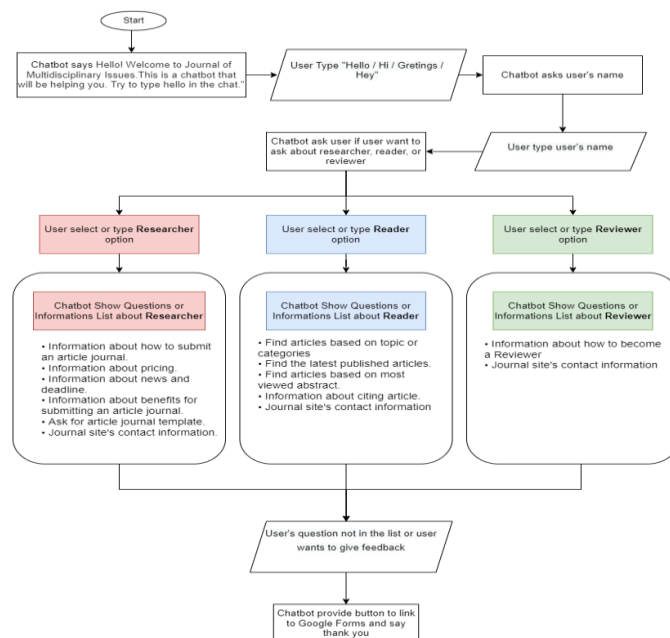


Fig 2. Features and conversation flow

After completing the discussions and interviews, the next step is to analyze the requirements for the Chatbot application that will be implemented on the website. The Chatbot application has the concept of Frequently Asked Questions, where the Chatbot will provide answers based on questions and commands posed by visitors. The Chatbot application will have various types of answers with rich response messages to facilitate interaction with visitors[14]. The Chatbot application system is designed and built using Google Dialog Flow service with the assistance of Natural Language Processing and Understanding. After conducting interviews there are Functional Requirements that will be implemented in the Chatbot based on the needs of the website owners, which can be seen in Table 2.

Table 2. Functional Requirements Table for Chatbot Application

Chatbot	User
Chatbot application can provide answers with a rich response format messages is like a button, pictures, lists, descriptions, and other.	Users can greet the Chatbot again and provide their name.
The Chatbot application can deliver a welcome message to the user when visiting the JMIS website, as well as ask for the visitor's name.	Users can choose from three options (as an article writer, reader, reviewer).
The Chatbot application can provide a menu of question types for the user to choose from, such as being an article author, reader, or reviewer.	Users can inquire about the list of information provided for article authors, article readers, and reviewers.

The Chatbot application can provide a list of questions that can be asked by article authors, article readers, and reviewers.	Users can provide feedback and suggestions through the Google Forms link provided by the Chatbot application.
The Chatbot application can answer the questions asked by users.	
The Chatbot application can answer questions from users who are authors of journal articles, readers of articles, and reviewers.	
The Chatbot application can prompt users to provide suggestions and feedback through Google Forms.	

In addition, there are also Non-Functional Requirements that are needed, as follows:

1. The Chatbot application and article recommendation page should have a responsive design, allowing access through mobile devices.
2. The Chatbot application uses English as the conversational language.

Design and Development Phase

In this phase, the architecture of the Chatbot application was designed, and various diagrams and interface designs were created to provide an overview of the Chatbot application. The architecture of the Chatbot application utilizes the Google Dialogflow service, as shown in Fig.3 [15]

During the design and development phase, the JMIS website can be accessed by visitors through both desktop and mobile devices[15]. The JMIS website is built using the Open Journal System, which is programmed in PHP and uses MySQL as the database. The website is enhanced with a Chatbot application built on the Google Dialogflow service. The Chatbot features related to article recommendations will direct visitors to the article recommendation page. On this page, queries are performed to retrieve journal article data from the MySQL database of the Open Journal Systems.

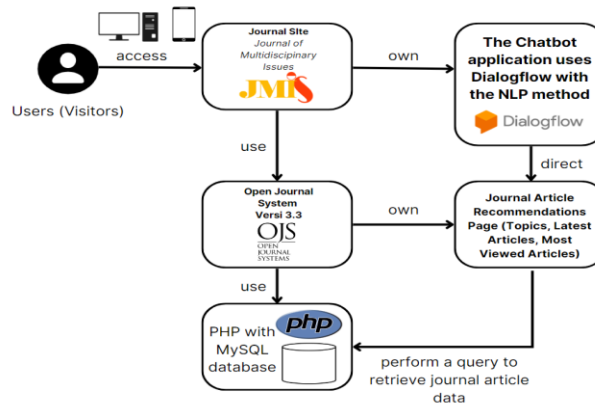


Fig 3. Architecture of JMIS Website with Chatbot

Interface Design

In this phase, an overview of the interface design for the JMIS website with the Chatbot application installed has been created. There are three types of interfaces that have been designed: the website structure with the Chatbot widget, the Chatbot conversation interface, and the article recommendation page[15].

Wireframe Design for the Website

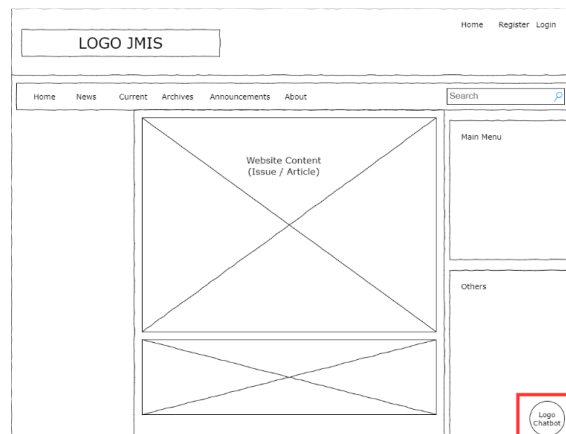


Fig 4. JMIS website structure

Fig. 4. presents the design of the JMIS website structure with the Chatbot application widget installed. It is indicated by a round button positioned at the bottom right corner of the website, featuring the Chatbot logo. Visitors can click on this button to display the Chatbot conversation window.

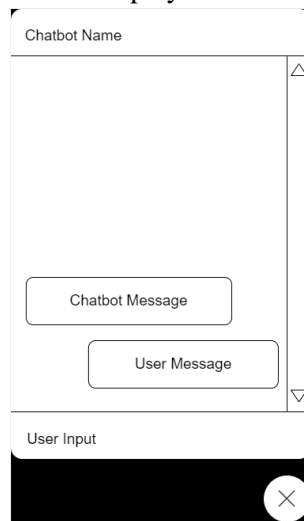


Fig 5. Chatbot Conversation Window Design

Fig. 5 showcases the design of the Chatbot conversation window after a visitor has clicked on the Chatbot button located at the bottom right corner of the website. The conversation window includes the name or title of the Chatbot, a chat box to view messages sent by both the Chatbot and the visitor, and an input section for the visitor to write messages or questions.

System Development Stages

The first stage in building the Chatbot application is creating the Agent. The configured name for the Agent is JMIS_Chatbot, and the chosen language for the Agent is English, as the requirement is for an English-speaking Chatbot. Once the Agent is created, the administrator page will be accessible and administrators can start to add Intents. The Intent "Welcome" is created to make the Chatbot greet the visitors when they access the JMIS website. There are two responses that the Chatbot will provide. First, it will welcome the visitor to JMIS and inform them that the Chatbot is there to assist them. Secondly, it will ask the visitor to say words like "hello," "hey," "hi," or similar greetings. Once the visitor utters any of these words, the Chatbot will activate the next Intent called the "Hello" Intent. The "Hello" Intent will be activated and triggered when a visitor sends a message similar to the training phrases shown in Fig. 6. If the visitor sends a message that is similar to human language or contains typos, the Chatbot will still be able to understand and receive the message due to the Natural Language Processing or Understanding method. This applies to all Intents. When the "Hello" Intent is activated, the response from the "Hello" Intent will be sent to the visitor. The response from the "Hello" Intent that will be received by the visitor can be seen in Fig. 7. The Hello Intent will give you an answer that varies according to Fig. 7., namely greeting back visitor and ask the name of the visitor.



Fig 6. Welcome Intent

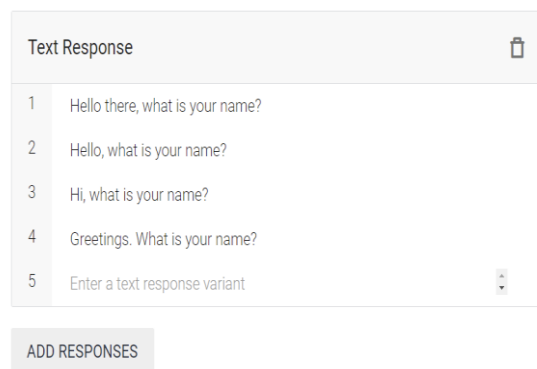


Fig 7. Hello Intent

Implementation Stages

The purpose of installing the custom header and footer plugin is to enable the storage of widget code snippets from the chatbot application, ensuring their appearance on the website interface. Upon successful installation of the custom header and footer plugin, the next step is to integrate the code snippet of the widget using JavaScript and CSS into the header and footer sections of the JMIS website. This integration allows the chatbot application widget to appear on the website.

Testing Phases of the Chatbot Application

The Alpha Testing phase, employing the Black-Box Test method, is conducted to assess the functional performance of the Chatbot application[14]. The objective is to determine whether the Chatbot can effectively execute Intent Matching using Machine Learning algorithms and Rule-Based Grammar Matching. This evaluation involves comparing the responses provided by users, utilizing natural language, with the training phrases within the Intent to ascertain compatibility. The Closed Beta Testing evaluation was conducted by inviting several real users to test the Chatbot application[14]. A total of 10 students who had previously visited journal websites to find references for their final projects and coursework were requested and invited to participate in the Chatbot application testing. A set of questionnaire questions was developed, referencing previous journal articles related to Chatbot testing, and administered to the respondents [18] [19]. These questions were modified to suit the Chatbot that had been created. After conducting the testing, the real users were asked to fill out a questionnaire to assess their perspectives and provide evidence regarding the acceptance of the Chatbot application[14]. The questionnaire results and the calculation can be seen in Table

Table 3. Questionnaire results and calculation

No	Questionnaire Questions	Score Calculation
1	Can the Chatbot application accurately answer your questions and provide the desired information?	Strongly agree 3 x 5 = 15 Agree 7 x 4 = 28 Neutral 0 x 3 = 0 Disagree 0 x 2 = 0 Strongly disagree 0 x 1 = 0
	Cummulative score calculation results	43/50 x 100% = 86%
2	Does using the Chatbot application assist you in searching for information related to journals?	Strongly agree 2 x 5 = 10 Agree 7 x 4 = 28 Neutral 1 x 3 = 3 Disagree 0 x 2 = 0 Strongly disagree 0 x 1 = 0
	Cummulative score calculation results	41/50 x 100% = 82%
3	Is the interface of the Chatbot application visually appealing and user-friendly?	Strongly agree 3 x 5 = 15 Agree 6 x 4 = 24 Neutral 1 x 3 = 3 Disagree 0 x 2 = 0 Strongly disagree 0 x 1 = 1
	Cummulative score calculation results	42/50 x 100% = 84%
4	Does the presence of the Chatbot application aid you in navigating the JMIS journal website?	Strongly agree 3 x 5 = 15 Agree 7 x 4 = 28 Neutral 0 x 3 = 0 Disagree 0 x 2 = 0 Strongly disagree 0 x 1 = 0
	Cummulative score calculation results	43/50 x 100% = 86%
5	Are you satisfied with the features provided by the Chatbot application?	Strongly agree 0 x 5 = 0 Agree 8 x 4 = 32 Neutral 2 x 3 = 6 Disagree 0 x 2 = 0 Strongly disagree 0 x 1 = 0
	Cummulative score calculation results	38/50 x 100% = 76%
6	In your opinion, does the Chatbot's varied response compared to plain text make it more engaging?	Strongly agree 7 x 5 = 35 Agree 3 x 4 = 12 Neutral 0 x 3 = 0 Disagree 0 x 2 = 0 Strongly disagree 0 x 1 = 0
	Cummulative score calculation results	47/50 x 100% = 94%

7	Is it necessary to update and add features related to the provided question functionalities?	Strongly agree Agree Neutral Disagree Strongly disagree	8 x 5 = 40 2 x 4 = 8 0 x 3 = 0 0 x 2 = 0 0 x 1 = 0
Cumulative score calculation results			48/50 x 100% = 96%
8	Do you find interacting with the Chatbot more engaging and interactive compared to reading regular information?	Strongly agree Agree Neutral Disagree Strongly disagree	2 x 5 = 10 5 x 4 = 20 3 x 3 = 9 0 x 2 = 0 0 x 1 = 0
Cumulative score calculation results			39/50 x 100% = 78%

The average score obtained from the Closed-Beta Testing of the Chatbot is 85.25%. Based on the Likert Scale, this result falls under the category of "Strongly Agree."

Alpha Testing Results

The conducted Alpha Testing demonstrated that all the implemented Intents of the Chatbot were able to provide appropriate responses in accordance with the messages received from the users. However, a minor revision was suggested by one of the Editors at JMIS, regarding the response for the "Articles Based on Topics" Intent. He requested that the response type be improved to utilize a list format in displaying the journal article topics. This enhancement would enable users to interact more easily by selecting the desired topics from the list, eliminating the need for manual command inputs.

Closed Beta Testing Results

The Closed Beta Testing yielded an overall score of 85.25% based on the questionnaire responses provided by 10 students. This result falls under the category of "Strongly Agree," indicating that the Chatbot application has been thoroughly tested and proven effective in assisting the users with accurate and relevant responses to their messages. The evaluators provided scores and feedback on various aspects of the Chatbot's performance. They assigned a score of 86% to the Chatbot's ability and accuracy in answering questions, and a score of 82% for its functionality in providing helpful information. The evaluators also rated the Chatbot's appearance and design with a score of 84%, and its navigational capabilities on the journal website with a score of 86%. However, the evaluators expressed a lower level of satisfaction regarding the features provided, giving a score of 76%. This score was the lowest among all the questions, indicating that the evaluators felt there was room for improvement in terms of the number of features offered.

Therefore, it is recommended to add additional features in future iterations. This feedback aligns with the high score of 96% given by the evaluators regarding the need for updates and additions to the existing features. Furthermore, the evaluators rated the attractiveness of the Chatbot's response variations compared to plain text, which received a score of 94%. They also found the interactive nature of the Chatbot's information service to be more appealing, giving it a score of 78% compared to conventional information sources. In addition, the evaluators provided suggestions for additional conversation topics that could be included in the Chatbot. Some of these suggestions included providing information on the duration of the journal article review process, instructions on using Mendeley for reference or citation retrieval, account recovery information, notifications for newly published articles, and whether final-year students are allowed to publish their theses as journal articles on the platform. The evaluators also had other questions for the reviewer.

IV. CONCLUSION

Based on the results obtained from the research stages, including requirement planning, system design and development, implementation, and testing, several conclusions can be drawn as follows:

1. The Chatbot application has been successfully created using the Rapid Application Development method, utilizing Google Dialogflow services that employ Natural Language Processing techniques. This enables the Chatbot to provide accurate responses to user queries, even when messages are written in natural language or contain typing errors.

2. The development of the Chatbot application using Google Dialogflow services has provided an administrator page, facilitating site managers in effortlessly adding conversation topic intents. This eliminates the need for additional technical efforts in learning the specifics of the Chatbot application.

3. Alpha Testing, employing Black-Box Testing techniques, yielded results indicating that all tested intents provided appropriate response answers across various question scenarios. The testing achieved a score of 85.25% based on questionnaires and Likert scale evaluations, along with valuable feedback suggesting potential additional features for future enhancements.

Recommendations

Based on the conducted research, several recommendations can be proposed for future studies related to the development of Chatbot applications for journal websites:

1. The developed Chatbot application is currently accessible only when visitors access the journal website via desktop or mobile devices. Future research should focus on integrating the Chatbot application with the journal's social media platforms such as Facebook, LINE, Telegram, or WhatsApp.

2. Additional features should be added to expand the range of questions that can be asked by various users, including article authors, readers, and reviewers.

3. It is recommended that future research on Chatbot application development for journal websites consider utilizing Google Dialogflow's Fulfillment feature, enabling direct integration with the journal's database.

In conclusion, the implemented Chatbot application has proven to be effective in providing accurate responses to user queries. The recommendations provided aim to further enhance the application's functionality and accessibility for a broader user base. Future research endeavors should consider the suggested improvements to advance the field of Chatbot technology in the context of journal websites.

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REFERENCES

- [1] R. Pakpahan, "ANALISA PENGARUH IMPLEMENTASI ARTIFICIAL INTELLIGENCE DALAM KEHIDUPAN MANUSIA," *Journal of Information System, Informatics and Computing Issue Period*, vol. 5, no. 2, pp. 506–513, 2021, doi: 10.52362/jisicom.v5i2.616.
- [2] Y. I. Chandra and D. Kosdiana, "Rancang Bangun Aplikasi Chat Bot Line Menggunakan Pendekatan Agile Process Dengan Model Extreme Programming Berbasis Web (Studi Kasus Di STMIK JAKARTA STI&K)," *Seminar Nasional Teknologi Informasi dan Komunikasi STI&K (SeNTIK)*, vol. 3, no. 1, 2019.
- [3] E. Larasati Amalia and D. Wahyu Wibowo, "Rancang Bangun Chatbot Untuk Meningkatkan Performa Bisnis," *Jurnal Ilmiah Teknologi Informasi Asia*, vol. 13, no. 2, 2019.
- [4] K. Malinka, M. Peresíni, A. Firc, O. Hujnák, and F. Janus, "On the Educational Impact of ChatGPT: Is Artificial Intelligence Ready to Obtain a University Degree? 2023." doi: 10.1145/3587102.3588827.
- [5] C. W. Okonkwo and A. Ade-Ibijola, "Chatbots applications in education: A systematic review," *Computers & Education: Artificial Intelligence*, vol. 2, p. 100033, Jan. 2021, doi: 10.1016/j.caeai.2021.100033.
- [6] G.-J. Hwang and C.-Y. Chang, "A review of opportunities and challenges of chatbots in education," *Interactive Learning Environments*, pp. 1–14, Jul. 2021, doi: 10.1080/10494820.2021.1952615.
- [7] C. Kooli, "Chatbots in Education and Research: A Critical Examination of Ethical Implications and Solutions," *Sustainability*, vol. 15, no. 7, p. 5614, Mar. 2023, doi: 10.3390/su15075614.
- [8] A. Følstad et al., "Future directions for chatbot research: an interdisciplinary research agenda," *Computing*, vol. 103, no. 12, pp. 2915–2942, Oct. 2021, doi: 10.1007/s00607-021-01016-7.
- [9] G.-J. Hwang and C.-Y. Chang, "A review of opportunities and challenges of chatbots in education," *Interactive Learning Environments*, pp. 1–14, Jul. 2021, doi: 10.1080/10494820.2021.1952615.
- [10] M. Ehrenpreis and J. DeLooper, "Implementing a Chatbot on a Library Website," *Journal of Web Librarianship*, vol. 16, no. 2, pp. 120–142, Apr. 2022, doi: 10.1080/19322909.2022.2060893.
- [11] A. Følstad et al., "Future directions for chatbot research: an interdisciplinary research agenda," *Computing*, vol. 103, no. 12, pp. 2915–2942, Oct. 2021, doi: 10.1007/s00607-021-01016-7.

- [12] T. Lalwani, S. Bhalotia, A. Pal, V. Rathod, and S. Bisen, "Implementation of a Chatbot System using AI and NLP," Social Science Research Network, Jan. 2018, doi: 10.2139/ssrn.3531782.
- [13] E. Adamopoulou and L. Moussiades, "An Overview of Chatbot Technology," in IFIP advances in information and communication technology, Springer Science+Business Media, 2020, pp. 373–383. doi: 10.1007/978-3-030-49186-4_31.
- [14] R. Tamrakar and N. Wani, "Design and Development of CHATBOT: A Review," ResearchGate, Apr. 2021, [Online]. Available: https://www.researchgate.net/publication/351228837_Design_and_Development_of_CHATBOT_A_Review.
- [15] R. Alegado and R. G. Luciano, "Design and Development of Chatbot Request System," ResearchGate, Jun. 2022, doi: 10.13140/RG.2.2.11593.01123.
- [16] "Journal of Multidisciplinary Issues." <https://jmis.site/index.php/JMIS> (accessed Feb. 15, 2022).
- [17] "About the Journal | Journal of Multidisciplinary Issues", Accessed: Feb. 15, 2022. [Online]. Available: <https://jmis.site/index.php/JMIS/about>
- [18] E. P. Sutono, "Aplikasi Chatbot Menggunakan Dialogflow Api Untuk Informasi Jadwal Misa Di Gereja Katolik Berbasis Android," *Jurnal Universitas Komputer Indonesia*, Oct. 2019.
- [19] F. F. Ramadhan, "Chatbot pada E-Commerce berbasis Android dengan Pendekatan Natural Language Processing," *Journal of Computer Science and Engineering (JCSE)*, vol. 2, no. 1, pp. 27–39, Feb. 2021.
- [20] J. Setiawan and E. Princes, "Refilling Knowledge and Intention to Use Travel Chatbot: Indonesian Context," Proc. 3rd Asia Pacific Manag. Res. Conf. (APMRC 2019), 2020, doi: 10.2991/aebmr.k.200812.009..