

## Development of OpenAI API-Based Chatbot to Improve User Interaction on the JBMS Website

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### ABSTRAK

Studi ini bertujuan untuk membuat chatbot inovatif, didukung oleh OpenAI API, yang dirancang untuk meningkatkan pengalaman pengguna di situs web Journal of Business, Management, and Social Studies (JBMS). Chatbot menjadi terkenal karena meningkatkan interaksi online dan pengambilan informasi. Pengembangan chatbot mengikuti metodologi prototipe terstruktur, termasuk *Requirement Gathering*, *Build Prototype*, *Refine Requirement*, *Customer Suggestion*, *Customer Evaluation of Prototype*, serta *Design and Implementation*. Pengujian Penerimaan Pengguna (UAT) memperoleh skor rata-rata 4,14, yang menandakan kepuasan pengguna yang tinggi. Hasil UAT menunjukkan pengalaman pengguna yang positif dan kepuasan terhadap chatbot. Integrasi OpenAI API meningkatkan ekstraksi informasi dari artikel jurnal dan rekomendasi artikel yang dipersonalisasi. Masukan pemangku kepentingan dari CEO JBMS, mahasiswa, dan dosen UMN menegaskan tingkat kepuasan yang tinggi. Penelitian di masa depan akan menyempurnakan fitur chatbot agar lebih selaras dengan kebutuhan pengguna, memperkuat perannya sebagai alat inovatif untuk pengambilan informasi dalam JBMS, dan meningkatkan layanan pengguna.

### ABSTRACT

*This study presents an innovative chatbot, powered by OpenAI API, designed to enhance the user experience on the Journal of Business, Management, and Social Studies (JBMS) website. Chatbots have gained prominence for improving online interactions and information retrieval. The chatbot's development followed a structured prototype methodology, including Requirement Gathering, Prototype Building, Requirement Refinement, Customer Evaluation, and Design and Implementation. User Acceptance Testing (UAT) scored an average of 4.14, signifying high user satisfaction. UAT results showed positive user experiences and satisfaction with the chatbot. Integration of OpenAI API improved information extraction from journal articles and personalized article recommendations. Stakeholder feedback from JBMS's CEO, students, and UMN lecturers affirmed high satisfaction levels. Future research will refine the chatbot's features to align better with user needs, solidifying its role as an innovative tool for information retrieval within JBMS, and enhancing user service.*

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## INTRODUCTION

The development of digital technology in the industrial era 5.0, which focuses on the merger between technology and humans, is developing very quickly (Siagian, 2023). Technology has become an essential need for humans, so it has become a demand in the evolution of the times. In daily life, humans today rely heavily on technology to facilitate their various activities, including in the fields of work, education, entertainment, and other aspects. In Indonesia, almost the entire population has adopted the use of technology in their daily lives. Data regarding the use of technology in Indonesia in 2022 shows that the Indonesian population reached 277.7 million people, with the number of connected smartphone users reaching 370.1 million users (DwiRiyanto, 2022). An interesting fact is that the number of connected smartphone users exceeds the population, reaching 133.3%. This indicates that some individuals in Indonesia own more than one connected smartphone device, which may be due to the diversity of their needs. In addition, there are 204.7 million internet users in Indonesia, which is equivalent to 73.7% of the total population. Meanwhile, active social media users reach 191.4 million people or about 68.9% of the total population. These data illustrate the extent to which Indonesia relies on technology to support the daily activities of its people.

In addition, data collected in 2021 also shows an increase in the number of lecturers in Indonesia over the previous decade (Mahdi, 2022). This trend shows that an increase in the number of lecturers can automatically contribute to an increase in the number of journal article publications in Indonesia. In terms of journal article publications, Indonesia has made significant progress over time. In 2013, Indonesia ranked 54th in the world in terms of the number of journal article publications. However, in 2020, Indonesia has managed to improve its position to 21st worldwide (Kristina, 2022). One of the factors supporting this increase is the availability of various venues for the publication of journal articles. An example is the Journal of Business, Management, and Social Studies (JBMS), which is a web-based publication platform that can be accessed for free.

JBMS was established in 2021 by the Appsikon Foundation and acts as a platform for sharing information in the form of journals globally (Journal of Business Management and Social Studies, 2021). JBMS publishes journals every three months and the articles published there can be indexed by various search engines such as Google Scholar, Apps Publication, Directory of Open Access Journals (DOAJ), Indonesian Journal Volunteers, Crossref, Neliti, and Mendley. JBMS also uses Turnitin to detect plagiarism and has been registered with the International Standard Serial Number International Center (ISSN) (ISSN, 2021). In addition, JBMS has been granted a Creative Commons Attribution\_shareAlike 4.0 International License, which provides certainty for users that the information obtained from JBMS can be used freely (CreativeCommons, 2021).

JBMS also provides dual language features (English and Indonesian) to facilitate Indonesian users who may not be fluent in English. In addition, JBMS users can upload their journal articles, allowing them to be viewed by other global users. However, users often experience difficulties in finding certain information within the journal article website, such as article upload requirements, article templates, and procedures for becoming an author. To overcome this problem, there is a new feature called chatbot, the system is a computer program designed to perform interactive interactions with users through text, voice, and visual elements (Hormansyah & Utama, 2018). Chatbot is one of the AI that can replace repetitive human work, for example interacting and providing information services to users (Setiawan & NG, 2023).

This chatbot can understand human language through the application of Machine Learning, Natural Language Processing (NLP), and Artificial Intelligence (AI) systems. Machine Learning is used to enable the chatbot to learn, recognize, and analyze different languages inputted into it (Harahap & Fitria, 2020). NLP helps chatbots understand human language and provide appropriate responses or answers, while AI allows chatbots to function like humans (Rahayu, Mukrodin, & Hariyono, 2020). Chatbot is the latest solution in the world of technology to replace routine work done by humans. The history of chatbots started a long time ago, with ELIZA as one example that was first created in 1966 by Joseph Weizenbaum. ELIZA was a chatbot that acted

as a psychotherapist interacting with humans. Over time, many chatbot competitors such as MegaHal, ALICE, ELIZABETH, and CONVERSE emerged (Herianto & Pradityo, 2019). Today, chatbots have been implemented in various digital platforms, including in e-commerce, customer service, and even in the medical field.

Chatbots have also been applied in the medical field, especially during the COVID-19 pandemic. They serve as a source of information, screening tools, and health monitoring, replacing risky direct human interactions during times of social distancing (Sugiono, 2021). In addition, chatbots are also used in the transportation field to assist users in booking tickets and getting the information they need. A recommendation system in a chatbot can facilitate users in finding information that suits their needs. This system will display recommendations based on analyzing user input, ensuring that the information presented matches the user's preferences and goals (Touimi, Adeladim, Faddouli, & Bennani, 2020). The recommendation system is formed using several tools that are also used to create a chatbot system.

Chatbot is created by combining several tools, namely Machine Learning, Natural Language Processing (NLP), and Artificial Intelligence (AI). The steps of making it from chatbot design, system design, good system development to avoid errors, chatbot testing to minimize system failures and evaluation of the chatbot system that has been successfully made. In the chatbot design step, developers will choose the platform used, choose the best technology to support manufacturing and choose a programming language. In the next step, the developer will create a conversation flow that is usually carried out in human interaction, choose the type of chatbot that follows the purpose of creation, and create an attractive user interface that is easily understood by users. The next step is the implementation of the conversation flow that has been made, starting to use APIs for the database, and using NLP technology for natural language processing. In the next step, developers will test the finished chatbot system to avoid failures when users use it. The final step is to analyze the data obtained from users after using the chatbot (Kusnanda, Sukarsa, & Susila, 2022). Looking at the steps of designing a chatbot takes a lot of time in research and development. Chatbot development can be made more effective and efficient by using Artificial Intelligence (AI).

The chatbot development process involves requirement gathering, prototype building, refining requirement customer suggestions, evaluation, design, and implementation. Creating an effective chatbot requires attention to these various steps. Moreover, the integration of OpenAI API has opened up new opportunities in the development of more interactive and efficient chatbots. Integration is the ability of a chatbot to connect with other applications or platforms so that it can directly direct users to the final destination (Setiawan & NG, 2023). The use of OpenAI API allows chatbots to provide more precise answers and improve user experience. This study aims to integrate the OpenAI API in a JBMS chatbot to improve the quality of interaction with users and provide better solutions for information search on JBMS websites. The development of the chatbot system allows users to find out how to become an author, and article templates, and ask questions if they are confused when extracting information from an article.

Following the recent study by Setiawan and NG (2023), it has come to light that numerous scholarly journal websites, even those accredited under the esteemed categories of SINTA-1 and SINTA-2, have yet to incorporate a robust service system, such as a chatbot. Notable examples include the Biolokus journal website and the Trisakti Accounting Journal (JAT), among others. Interestingly, this dearth of service systems extends to some journal websites that have achieved accreditation under the SINTA-3 tier. Conversely, there exist select journal websites that, despite the aforementioned accreditation distinctions, have implemented assistance features via the WhatsApp platform. Noteworthy exemplars encompass the Scientific Journal of Information Systems Technology and the Journal of Urban and Environmental Technology, among others. It is noteworthy that, as of the research conducted, none of the scrutinized journal websites have integrated a chatbot system.

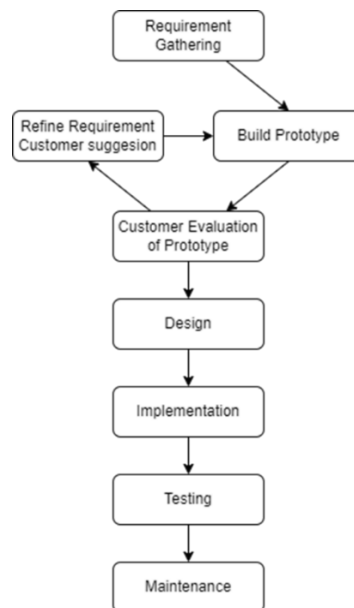
In response to this evident gap, a chatbot was meticulously developed and deployed on a journal website. The methodology employed in this chatbot's development adheres to the

prototyping model, a framework chosen for its propensity to foster innovation and operational efficiency. This approach underscores the commitment to ensuring that the chatbot's evolution remains at the forefront of cutting-edge technological advancements.

Furthermore, this development venture leveraged a range of sophisticated technologies, including Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), and the OpenAI API. These technological components were strategically harnessed to augment the overall user experience and deliver optimal solutions to users in their quest for information retrieval.

## RESEARCH METHODS

In using the prototype SDLC model, some stages are needed so that the system can run well according to user needs. The following are the stages of the prototype SDLC model, namely:



**Figure 1. Model Prototyping**

Figure 1 shows a modified flowchart of the prototype model, sourced from javaTpoint (n.d.). Key alterations were introduced in the stages of rapid decision-making and customer acceptance to expedite the process. The flowchart outlines the stages involved in utilizing the prototype model, encompassing Requirement Gathering, Prototype Development, Refinement through Customer Feedback, Customer Prototype Evaluation, Design, Implementation, Testing, and Maintenance.

Requirement Gathering involves collecting website needs, while Prototype Development entails creating a system prototype. The Refinement through Customer Feedback stage combines user requirements from the website CEO with user-provided suggestions. Customer Prototype Evaluation involves user assessment and evaluation of the prototype system, while the Design stage transforms the evaluated prototype into a user-accepted system. Implementation integrates the created system into a website, followed by Testing, where users assess its functionality. Lastly, Maintenance facilitates system updates and upkeep for optimal performance.

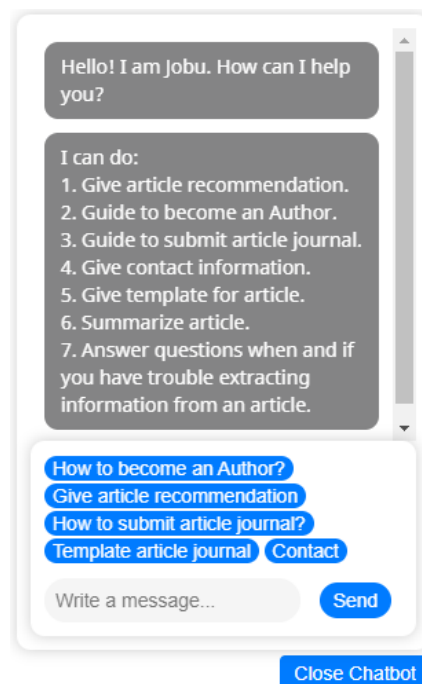
In this research, the prototype model is utilized up to the implementation stage, specifically on a dummy website named *researchjournal.xyz*, equipped with Open Journal Systems (OJS). OJS is specialized software for online management and publication of scientific journals (Handayani, Febriyanto, & Shofwatullah, 2019). The research also employs testing methodologies to analyze the data gathered from the administered questionnaires. Two distinct testing techniques are employed in this study: Open Beta Testing and Closed Beta Testing. Open Beta Testing involves a substantial number of respondents, while Closed Beta Testing restricts the number of

participants involved in the testing process (Susanto, Maulana, & Binabar, 2020). Open Beta Testing encompasses several testing approaches, with User Acceptance Testing (UAT) being one of its pivotal components. UAT constitutes a comprehensive evaluation conducted directly on end-users and the system itself, with the primary objective of assessing the system's utility in alignment with user requisites (Chamida, Susanto, & Latubessy, 2021). It is worth noting that UAT serves as the concluding phase in the system testing process, following the culmination of the development stage. The core purpose of UAT is to validate whether the system garners user acceptance (Hady, Haryono, & Rahayu, 2020).

## RESULT AND DISCUSSION

The system evaluation stage involves assessing the chatbot by both the CEO of the JBMS website and various users, including UMN students, library staff, and lecturers. Researchers provided detailed explanations of the chatbot system and its functionalities via the WhatsApp (WA) platform and shared the website link for reference.

Results from the evaluation indicate the CEO's agreement with the system's effectiveness. User evaluation encompassed three UMN students, one library staff member, and three lecturers who acted as thesis respondents. They provided feedback through a Google Form, rating the chatbot's functionality (average score of 4.23, signifying agreement), its ability to address user queries (average score of 4.18, indicating satisfactory problem-solving capabilities), overall user satisfaction (average score of 4.14, demonstrating user contentment with the chatbot's performance), and the user interface (average score of 3.56, reflecting a neutral stance).



**Figure 2. User Interface Chatbot**

Figure 2 shows the user interface of the chatbot that has been created and evaluated by users and consumers. In the chatbot, there is an opening sentence along with a brief explanation of the chatbot function. The chatbot also provides search recommendations to make it easier for users when use the chatbot. In addition, users can also type what they need and will be answered by the chatbot.



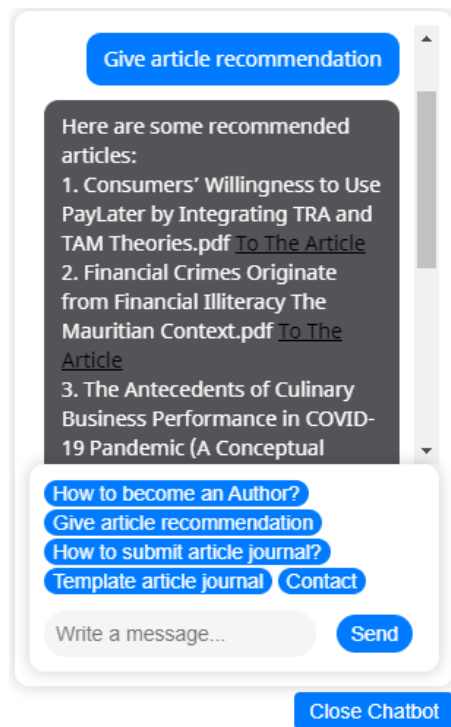


Figure 3 A. Article Recommendation

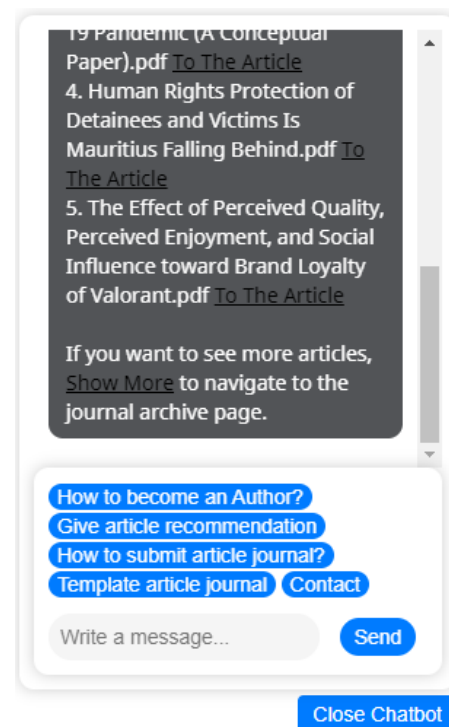


Figure 3 B. Article Recommendation

Figure 3A and Figure 3B show an article recommendation feature that can be used by users. The feature can provide users with the 5 best articles taken from the database. When the user still does not find the required article, the "show more" feature is given to display more journal articles.

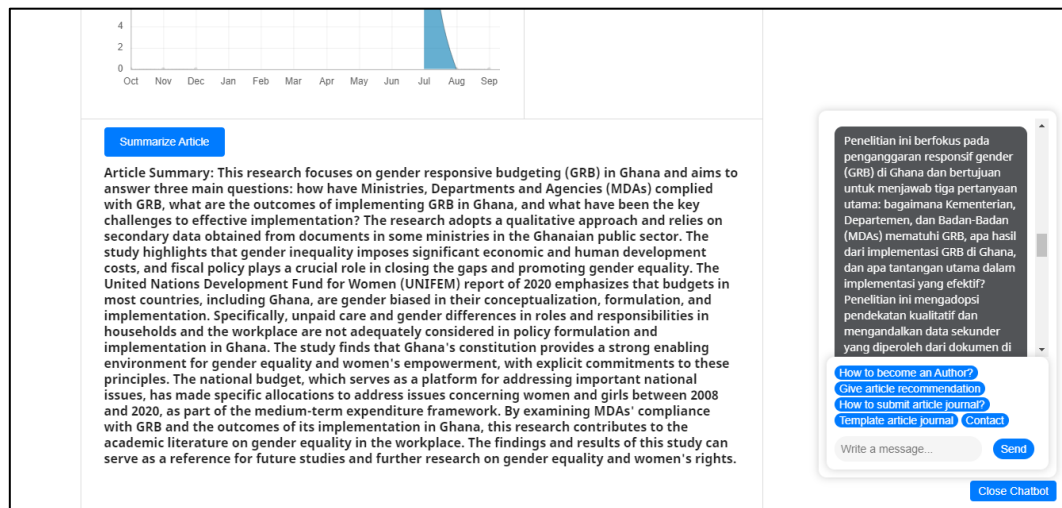


Figure 4. OpenAI Function

Figure 4 is the use of the OpenAI API integrated into the chatbot. This feature makes the chatbot have a function like ChatGPT that can answer all the difficulties of users when looking for information. In the picture, the user asks the chatbot to summarize the article that has been selected. But not only that, the chatbot can also explain the details of the article. This feature will pamper users when they are looking for information with the idea of one-stop shopping.

The design of a prototype chatbot integrating the OpenAI API for the Journal of Business, Management, and Social Studies (JBMS) website was successfully developed and testing and evaluation were carried out. Testing has been carried out to ask respondents to provide suggestions

for the chatbot that has been made. The following is a table of results from comparing the use of chatbots for the JBMS website before and after implementation.

**Table 1. Results Comparison of Chatbot Usage**

Variable	Before	After
<i>Searching Article Journal</i>	Search for manuals in the navigation bar archive and current. Users must open the journal one by one to search for articles.	The chatbot provides a variety of information to search for articles. Users can search for articles on the chatbot and will be given article recommendations.
<i>Become an Author</i>	Users must search for the requirements to become an author in About Us on the navigation bar.	The chatbot can provide complete information for users who want to become authors by directing users to the about the journal page.
<i>Upload Article</i>	Users must find out for themselves how to upload article on the JBMS website. The website does not provide steps for uploading articles, so it can confuse the author.	Chatbot can direct users to the submit article page. After that they can type or select "How to submit article journal", the author will be directed to the login/register page first and will go directly to the article upload page.

This research aligns with prior work that successfully employed the ABCDE model to create user-friendly chatbots. The ABCDE model, encompassing Attraction, Build-up, Continuation, Deterioration, and Ending stages, achieved a conversational and friend-like user experience, enhancing predictability and user comfort (Croes & Antheunis, 2021). Similarly, research focusing on chatbot design for JBMS websites through integration with the OpenAI API aimed to foster user-friendly interactions, enabling the use of functions such as ChatGPT. These user-friendly interactions were established through the chatbot's introduction, user-friendly questions, and easy user comprehension.

Earlier studies also delved into chatbot planning utilizing statistical analysis via PLS-SEM, revealing chatbots' capacity to offer innovation, usability, convenience, and positive user attitudes (Richad, Vivensius, Sfenrianto, & Kaburuan, 2019). Integrating the OpenAI API in chatbot design contributed to innovation and user-friendliness. Recent chatbot innovations, such as recommendation systems using LDA Bayesian statistics, have also been explored, addressing users' information extraction needs (Touimi, Adeladim, Faddouli, & Bennani, 2020). JBMS website chatbot design, integrating the OpenAI API, refined personalized recommendation systems to cater to user needs, especially in retrieving information from journal articles.

Comparative research involving study groups with and without chatbot usage demonstrated that chatbots enhance the learning process (Yin, Goh, Yang, & Xiaobin, 2021). The integration of OpenAI API in JBMS website chatbot design facilitates user-friendly one-stop shopping experiences and assists users in navigating complex journal articles.

In the course of consecutive evaluations pertaining to ease of use, problem-solving efficacy, user satisfaction, and the pursuit of consistency, a Likert 5-scale was employed to gauge the following outcomes: In assessing the ease of use of the chatbot, the average score attained was 4.23. This score underscores the respondents' consensus in favor of the chatbot's impeccable functionality. Regarding the chatbot's problem-solving capabilities, it garnered an average score of

4.18, signifying unanimous agreement among respondents concerning its ability to furnish solutions to user inquiries. User satisfaction, as experienced through interaction with the chatbot, yielded an average score of 4.14. This score reflects a unanimous consensus that the chatbot, as constructed, meets the expectations and fulfills the satisfaction of its users. Conversely, the evaluation of the chatbot's adherence to consistent design principles resulted in an average score of 3.56. This outcome indicates a neutral stance adopted by the respondents regarding the interface's consistency.

Following the evaluation stage, user suggestions prompted several enhancements. This included changes to chatbot colour schemes and improvements to Natural Language Processing (NLP), involving vocabulary expansion and standardizing case-sensitive queries. Additionally, users recommended the addition of a "What can a chatbot do" feature, which was incorporated into the chatbot's introductory message, offering users an overview of its capabilities.

## **CONCLUSION AND RECOMMENDATION**

### **Conclusion**

In this study, researchers successfully designed a chatbot integrated with the OpenAI API and measured it using the UAT method. The evaluation results through Open Beta Testing showed that users and customers agreed that this chatbot provides convenience and effective solutions. The evaluation also showed a high level of satisfaction and a positive new experience for users. In addition, this chatbot provides relevant features that meet user needs.

In the process of developing the chatbot, the researcher used a prototyping method that allowed the participation of users and customers, in the creation of the chatbot. The evaluation provided by the users was invaluable as it allowed the researcher to identify flaws and make changes in the chatbot according to their wishes. The prototyping method proved to be very effective in ensuring user satisfaction with the developed system. This research makes a positive contribution to the development of chatbots on journal websites.

In this research endeavour, the researchers adeptly engineered a chatbot, seamlessly integrating the OpenAI API, and meticulously subjected it to User Acceptance Testing (UAT). The findings of the Open Beta Testing unequivocally affirm the chatbot's efficacy, as users and customers uniformly concurred that it delivered convenience and effective solutions. Additionally, the chatbot was noted for its relevance and ability to cater to user requirements. The chatbot's development process adhered to a prototyping methodology that actively engaged users and customers in its creation. The invaluable feedback garnered from users facilitated the identification of imperfections, thereby enabling the researcher to refine the chatbot following user preferences. Notably, the prototyping approach emerged as highly effective in ensuring user satisfaction with the final system iteration. This research stands as a commendable contribution to the advancement of chatbot technology on journal websites.

### **Recommendation**

To enhance the quality of the chatbot system, several key recommendations warrant consideration. Firstly, there is a need to augment the volume of questions and vocabulary employed within the Natural Language Processing (NLP) framework. By broadening the scope of NLP, the chatbot can better comprehend user requirements. Furthermore, it is imperative to address the existing limitations of the chatbot's user interface (UI), which currently lacks visual appeal. The implementation of a more engaging and user-friendly UI design holds the potential to pique user interest and engagement with the chatbot. However, a notable challenge pertains to the utilization of the OpenAI API, which comes at \$20 (approximately Rp 307,764). To access this API, website proprietors must be willing to allocate these funds towards enhancing chatbot functionality, thereby presenting a potential solution.



The implementation of these recommendations aims to elevate the chatbot's quality, expand its vocabulary, foster comprehensibility in user interactions, and captivate users through a more appealing interface design. It is our fervent hope that these suggestions will contribute positively to enhancing the overall user experience with chatbots on the JBMS website.

### Future Research

In the conclusion of the journal article, several research suggestions were found that can be done to deepen the understanding of the effectiveness of using chatbots in increasing user satisfaction and the solutions provided. Further research can be focused on developing more relevant chatbot features according to user needs and expectations. In addition, an exploration of the use of other evaluation methods that can measure the success of chatbots can also be carried out. The context of using chatbots in business and management is also an interesting area to explore.

Through these studies, it is hoped that a deeper understanding of the use of chatbots as well as increased user satisfaction in their use will be obtained. It is hoped that these suggestions will inspire further research in this area, thus making a valuable contribution to the development of chatbots and their application in various contexts. Hopefully, this information will be useful and inspire further research studies in the field of chatbot development.

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