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# Chatbot with Dialogflow for FAQ Services in Matana University Library

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## Abstract

Industry 4.0 and the situation of the Corona pandemic encourage the development of chatbots. The Matana University Library in Indonesia is facing protocol implementation due to the pandemic, library staff vacancies, and the need to improve 24x7 online services. Therefore, a solution is needed to resolve these kinds of problems. The success of chatbots in the business world and public services is the reason for the adoption of chatbots to overcome these problems. The first phase of chatbot development focuses on Frequently Asked Questions (FAQ). The development model for chatbot applications development uses a prototyping model by utilizing Dialogflow, namely the natural language understanding (NLU) platform. Agents, intents, entities, contexts, events, fulfillment, and integration need to be considered before designing a chatbot conversation. The test results show that the chatbot is feasible to be accepted and operate. The variety of phrases entered into the Intent will improve accuracy. However, the accuracy of this chatbot will become lower if the language conveyed uses a lot of abbreviations or local/foreign languages. In a further development, it is necessary to apply the system implementation and system maintenance phases, make chatbot responses not rigid like robots, and add other library services such as new member registration, information on book availability, user satisfaction, and so on.

## Keywords

Chatbot, Dialogflow, Library, Prototyping

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## 1. Introduction

The fourth industrial revolution is ongoing, and the digital revolution is the basic foundation marked by the progress of the Internet, sensors, artificial intelligence, and machine learning [1]. Humans and computers need to share tasks according to their strengths to achieve their goals [2]. Today, much research is directed to artificial intelligence [3]-[7]. The Corona pandemic that has hit the world has resulted in the presence of a new normal, people are starting to get used to working and studying from home. The new normal is supported by the capabilities of information and communication technology, not just automation but also intelligent systems. Artificial intelligence (AI) based intelligent systems have helped many companies to solve their problems [8]. One application of AI to serve customers is a chatbot. A chatbot is a chat robot that is programmed based on artificial intelligence, especially natural language processing (NLP) so that it can interact with humans through text format.

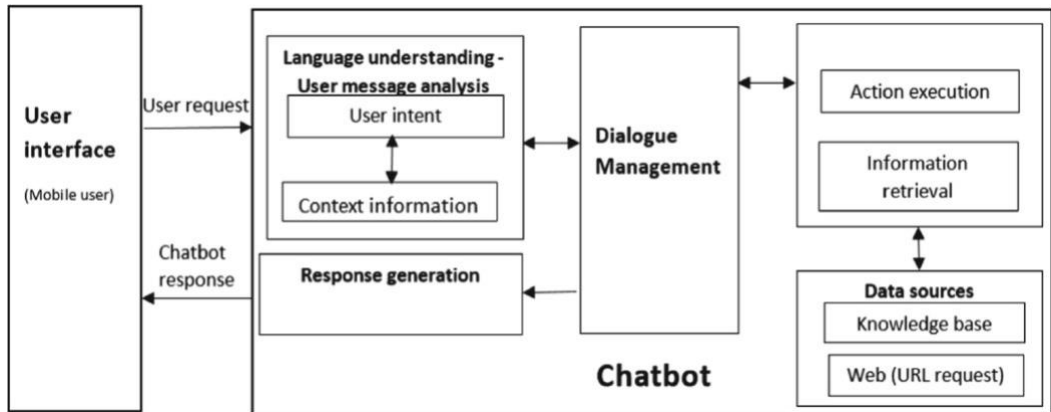
The benefits of chatbots are already being felt in the business environment such as

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Supporting customer service, providing a better customer experience, and saving on operational costs [9]. There are at least three reasons for chatbot development. Those are the increasing of Internet users, technological advancement (especially AI), and the developer ecosystem [10]. Fig. 1 shows a general chatbot architecture, it shows the development of a chatbot that is not easy. Currently, there are many tools for chatbot development. One of the most used is Dialogflow developed by Google.



**Fig. 1.** General chatbot architecture

Dialogflow is a natural language understanding (NLU) platform to makes it easier to design and integrate chatbots into other applications [12] and run in the cloud. NLU is part of natural language processing (NLP) which is the basis for developing chatbots. Before using Dialogflow, it is necessary to design a chatbot conversation where there are important things that need to be prepared such as agents, intents, entities, contexts, events, fulfillment, and integration so that Dialogflow can shorten development time and not be preoccupied with various device installations.

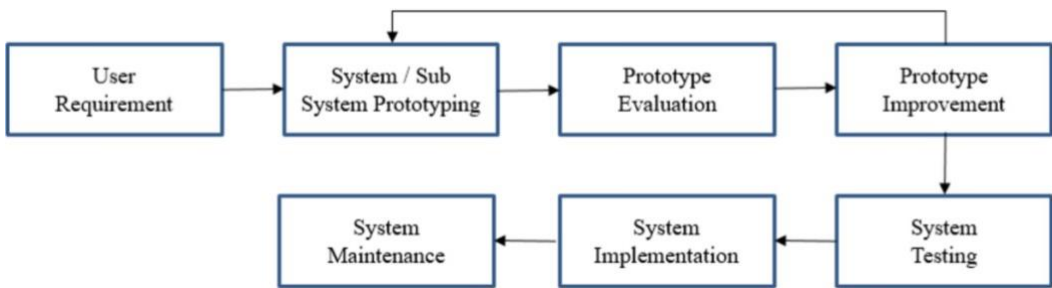
Indonesia is a country located on the Asian continent, with a population of 270.20 million people (results of the 2020 population census) [13], and has 718 regional languages [14]. Indonesia has many campuses, both public and private. From the search results on library websites in Indonesia, most of the websites have not been equipped with chatbots, similar to the Matana University library website. Of course, each library has its problems. Currently, the Matana library is facing the following conditions:

1. During this pandemic, the Matana library must implement health protocols, that reduce the comfort compared with the conditions before the pandemic
2. Library employees have resigned but it is not easy to find the replacements
3. Improve services that can help 24x7, especially in answering questions via telephone or WhatsApp.

Due to the Corona pandemic, lectures at Matana are conducted online. Over the past year, many activities have been carried out online. The new normal starts running. Therefore, the Matana Library website needs to be facilitated by a chatbot to serve its FAQs and welcome the new normal. The chatbot that is built is limited to the Indonesian language. However, this cannot prevent those who speak mixed languages such as Indonesian from being combined with regional or foreign languages.

## 2. Development Model

Chatbot application development uses a prototyping model, Fig. 2. This model has seven phases, namely user requirements, system/sub-system prototyping, prototype evaluation, prototype improvement, system testing, system implementation, and system maintenance. The system implementation and system maintenance phases have not yet been implemented.



**Fig. 2.** Prototyping Model [15]

During the user requirement phase, interviews and observations were carried out. Interviews were conducted with the head of the library to find out what questions are often asked by library members who become FAQs. Observations were made on procedures, related documentation, and tools owned by the Matana library. At the system sub-system prototyping phase, prototypes are made starting from a small prototype part (subsystem) to the whole system (system) according to the cycle. Next, the prototype built is evaluated at the prototype evaluation phase. The results of this evaluation are followed up in the prototype improvement phase, where the prototype is improved and improved. If there is still a prototype that needs to be built, return to the system/sub-system prototyping phase. However, if all the prototypes have been done, proceed to the system testing phase until the system can be accepted. The system that is already feasible is then implemented to be operated at the system implementation phase. The system that has been operated is then treated, in the phases of system maintenance, so that the system is sustainable in improving services.

The chatbot is built using Dialogflow. A chatbot conversational design FAQ is prepared and defines agents, intents, entities, contexts, events, fulfillment, and integrations to be implemented in Dialogflow.

### 3. Results

The results of the FAQ observation at the Matana library, as shown in Table 1. This is the conversation base to build on the chatbot.

Table 1. List of the FAQ.

| Question                                                                                                | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Good morning/ afternoon/ evening, Sir/ Mam                                                              | Good morning/ afternoon/ evening. May I help you?                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Is our library service hour still open at night during the pandemic Covid19?                            | No. Matana University Library is closed from July, 5 to 20, 2021                                                                                                                                                                                                                                                                                                                                                                                                      |
| Is our library open during this Enforcement of Emergency Community Activity Restrictions (PPKM)?        | No. Matana University Library is closed from July, 5 to 20, 2021                                                                                                                                                                                                                                                                                                                                                                                                      |
| How do I return my loan books?                                                                          | Option 1: Contact us to make an appointment when you will come to the library to return it. Option 2: Just stay at home and please save the book first to be returned later when the library is open and serving again.                                                                                                                                                                                                                                               |
| Will my fines increase every day since my borrowed books should be returned when the library is closed? | No. Fines are not calculated during the library's closed service period.                                                                                                                                                                                                                                                                                                                                                                                              |
| How do I get my library exit clearance without having to come to the library?                           | By using your Matana email account, please send your full name and NIM to the library email, library@matanauniversity.ac.id, and state your need. We will process it then.                                                                                                                                                                                                                                                                                            |
| How to properly cite someone else's intellectual work?                                                  | First, make sure what model/style of citation is applied. Is it Harvard, MLA, IEEE, or others? Second, make sure the type of work and authorship. Third, paraphrasing by rewriting other people's ideas/ideas into your own words and/or rewriting what other people's ideas/ideas are in the right way so that you avoid plagiarism. If applying the APA citation model/style, please read more at <a href="https://apastyle.apa.org/">https://apastyle.apa.org/</a> |
| Is there an application that can be used to make citations or a bibliography easier?                    | Yes, there are some applications. You can use one of them, such as Mendeley Reference Manager. You can access and download it at <a href="https://www.mendeley.com/">https://www.mendeley.com/</a> When you are facing difficulties in using it, please contact us for help. Our library facilitates a Mendeley Workshop class, "Scientific Writing: Citation and Bibliography" as well.                                                                              |
| How can I find out what reading material we have in our library?                                        | Please access our library web: <a href="http://library.matanauniversity.ac.id/matanalib">http://library.matanauniversity.ac.id/matanalib</a> . In addition to printed book information, you can also get not less than 200 electronic book titles that can be accessed in full text as well as links to various electronic journals and access/borrow to other                                                                                                        |

electronic libraries, such as iPUSNAS from the National Library of the Republic of Indonesia, and iBi Library from Bank Indonesia.

Where can I get examples of my seniors' thesis/Final Year Project?

Besides coming directly to the library, you can also access it at

<http://repository.matanauniversity.ac.id:8080/xmlui/>

Does Matana publish a journal? How is a journal different from an article?

Yes, for the last few years, we have published *Statera*, an accounting journal, and *Marca*, an architecture journal. Journals are different from articles. Try to pay attention and analyze the difference by observing from <http://library.matanauniversity.ac.id/ojs/> You will find that each journal issue consists of some articles.

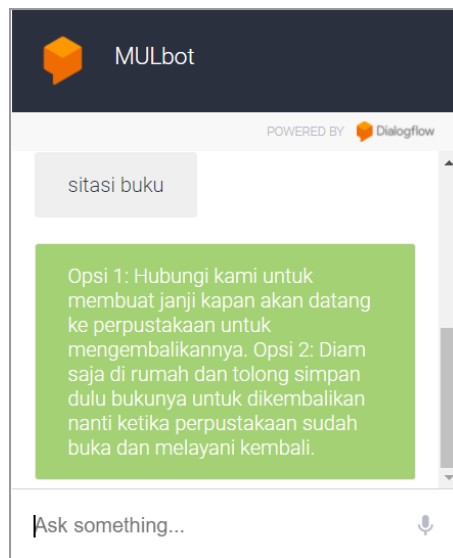
The list of findings by the observation of question submission on the WhatsApp application between students and the library stairs is shown in Table 2.

Table 2. List of findings.

| Findings                                                                                                                                  | Description                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Use many abbreviations, such as:<br>"gak"<br>"perpus"<br>"yg"<br>"makasih"<br>"info"<br>"dr"                                              | "tidak" → no<br>"perpustakaan" → library<br>"yang" → that<br>"terima kasih" → thank you<br>"informasi" → information<br>"dari" → from |
| Use local language such as "mbak" atau "mba"                                                                                              | Usually used in Jawa area for older woman                                                                                             |
| Not use question words to ask question as in the sentence of "Kira kira info pengecekan plagiarisme dikasih dr dosen atau dari ka nurul?" | The word "Kira Kira" should be "Darimana"                                                                                             |

In Dialogflow, the Agent is filled with MULbot (Matana University Library Robot). Intents are filled with a list of questions (Table 1), synonyms for a question, and a list of findings (Table 2). Responses are filled with answers (Table 1). Integration using a web demo. After the integration is completed, the chatbot prototype is ready to be tested.

In Fig. 3, see seen chatbot's wrong response to the statement delivered by users. The problem can be solved by adding the sentences of "book citation" (in Bahasa, "sitasi buku") to the Intents (Dialogflow) that handle how to cite the articles or books according to Table 1.



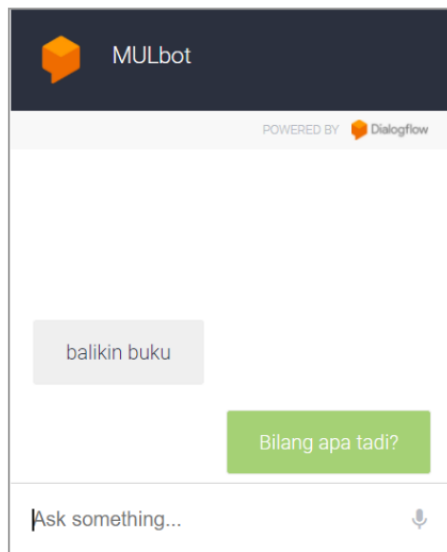
**Fig. 3.** Wrong chatbot response.

After the revision is done, the result can be seen in Fig. 4.



**Fig. 4.** Chatbot's response is correct after it has been fixed.

Also, the result where the chatbot doesn't understand the user's question is shown in Fig. 5 The problem occurs because the handling of the phrase is not yet available.



**Fig. 5.** The chatbot doesn't understand what the user means

Therefore, this problem can be solved by adding or completing phrases, such as "return the book" (in Bahasa, "balikin buku"). After adding a phrase to handle it, the chatbot understands and responds correctly, as in Fig. 6.



**Fig. 6.** The chatbot has understood and responded correctly

The test results are getting more accurate in line with the addition of phrases on the Intent feature which are trained by machine learning. The final result of the test is satisfactory as expected.

## 4. Conclusion

The chatbot has been successfully developed using Dialogflow to serve the FAQ needs in the Matana University library. The addition of phrases that can accommodate various variations submitted by users in the Intents feature increases the accuracy of chatbot responses. This chatbot has limitations such as incorrect responses when users use mixed languages (mixed Indonesian, English, or regional languages) or use many abbreviations if users use new synonyms or vocabulary, the chatbot needs to be inputted and retrained, and chatbot responses are still rigid (like a machine). In the future, the development of artificial intelligence (AI) and high computing will make this chatbot more reliable and could reduce a lot of work for librarians.

This chatbot will be continued to the phase of system implementation and maintenance. A chatbot is made more reliable for responding to various items such as providing book descriptions, information on the status of a book or book borrowing, handling new member registration, obtaining user satisfaction, and so on.

## Acknowledgment

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