

CHATBOT FEATURES ON WEBSITES USING DIALOGFLOW FRAMEWORK WITH RULE-BASED METHOD

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Abstract

A chatbot is an artificial intelligence (AI) technology that can mimic human conversation in the form of text or voice messages through a website, or mobile application. Chatbots are widely used to facilitate communication, such as finding information, or services. In this research, the difficulty of accessing information in obtaining answers to questions asked by the public, as well as taking too long for the admin to reply when providing information to people who ask questions related to information about the topic raised, is an initial problem that will be solved in this research. Chatbot is a solution that can overcome the above problems, chatbot itself is designed to help food license applicant services on the website of the Semarang City Health Office in the field of Pharmacy and Perbekes. By utilizing the Dialogflow framework, this chatbot will use the Rule-Based method because in this development, the Rule-Based method can adjust common questions and answers that are often asked by the public, and can also be changed and even expanded to manage conversations without experiencing much difficulty in changing them that follow questions that are often asked over time. The system consists of agents, intentions, and training phrases that will be trained to understand various questions and provide relevant responses. This chatbot development aims to improve the efficiency of food licensing services, reduce applicant waiting time, and provide accurate and easily accessible information. The test results in this development are on a chatbot system that can run well, and is able to understand various kinds of questions related to food licensing, and provide appropriate responses in accordance with the predetermined intent. In addition, an evaluation of the level of user satisfaction will be carried out to measure the success of this system. This chatbot can improve the quality of public services in the field of food licensing and provide convenience for the public in processing licenses.

Keywords: Chatbot, Dialogflow, Rule-based, Website.

1. INTRODUCTION

In the scope of the modern digital age, the advent of chatbots has changed the way we interact with our customers. Chatbots, powered by advances in artificial intelligence and natural language processing, offer a humanized information interface and can serve as digital assistants capable of performing a wide variety of tasks[1]. A chatbot can be created by yourself or by utilizing chatbot development services available in chatting applications[2].

Before the existence of the chatbot, the public had difficulty in finding information about food licensing and it took a long time for the admin to reply to questions asked by the public. The number of people who ask questions is a problem faced because the admin has to reply to questions one by one via Whatsapp, from the large number of people in the city of Semarang who will apply for food licensing and also ask about this, and the admin also

has to serve people who come directly, making a problem where it takes a long time to reply to questions from the public so that problems arise where people have difficulty getting in-depth information.

Chatbots make customer service more efficient and communication easier. A popular platform for developing chatbots is Dialogflow[3]. This is a Google Cloud Platform feature that provides machine learning and natural language processing (NLP) capabilities[4]. Natural Language Processing (NLP) is a field of computer science created to help computers understand human language like humans do. While humans are able to understand sentence structure and implied meaning (semantics) with ease, computers still have difficulty processing natural language[5]. NLP is here to bridge this gap to create more sophisticated chatbots. As the demand for efficient and accessible communication channels increases, the development of chatbot

functionality on websites has become an important aspect of digital transformation[6].

A chatbot is a computer program designed to mimic an interactive conversation or communication with a user (human) through text, audio, or visual elements that are part of human communication needs[7]. Chatbots utilize various modern technologies, including artificial intelligence (AI), machine learning, deep learning, and natural language processing (NLP)[8].

While machine learning can be applied as the science of machines learning, analyzing, and recognizing different languages in a chatbot, natural language processing (NLP) has the ability to understand human language and then provide a response that matches the language used by the chatbot user[9]. The way the bot works is based on checking keywords in the incoming data and responding with the most similar and most appropriate keywords or word patterns from the database[10]. It can be interpreted that when a user sends a request, then the bot will respond with a certain reply according to the keywords sent[11].

In the context of technology in public services, chatbots can be used to provide access to public information, community services, provide services to license applicants, or can also answer general questions. Therefore, the development of chatbots provides better statistics to users and helps them in making decisions[12].

In terms of ease of use, a chatbot application system can function similarly to customer service on a website system. Although not all public service sectors in Indonesia use chatbots in their services. One of them is the Semarang City Health Office of Pharmacy and Medical Supplies.

2. RESEARCH METHODS

2.1. Method

Rule-based method is a way of solving problems by describing patterns. The rule in this method consists of two parts: condition and action. The action will be performed if the condition is met, either in whole or in part. The rules obtained are then implemented into an algorithm. This algorithm will determine the most appropriate rule to solve a problem[13].

The Rule-Based method has a weakness in terms of self-learning ability. Because this system cannot create new rules based on new information or experience it receives. This is because rule-based systems only work based on predefined rules. When faced with a new situation that is not covered by

existing rules, this system cannot adapt and provide the right solution[14].

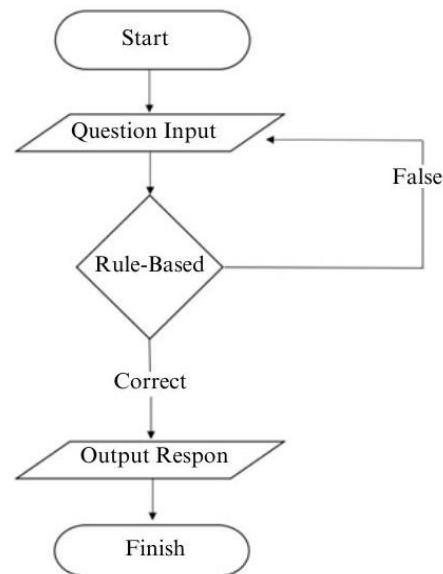


Figure 1 Rule-Based Flow

In figure 1, is a chatbot that relies on a set of rules to understand and answer the user's question. The user initiates the interaction, the chatbot processes the question, matches it to the rules, searches for an answer, and provides a response. If the question matches the rules that have been entered, the chatbot will reply according to what is needed, otherwise if the question does not match the rules, the chatbot will give a general response or error message.

2.2. System Analysis

Research methodology is a structured and logical scientific way to conduct research. In this chatbot feature development research, the method used is the case study method. This method focuses on one particular case to understand more deeply about the case[15].

Building an effective system requires thorough and detailed information gathering. This information becomes the foundation for all system components, ensuring a result that meets the needs and design goals. The Dialogflow platform plays an important role in this process. It matches the words of the user request with its database. Next, Machine Learning "Agents" process the information and generate responses and output data in a user-friendly JSON format[16].

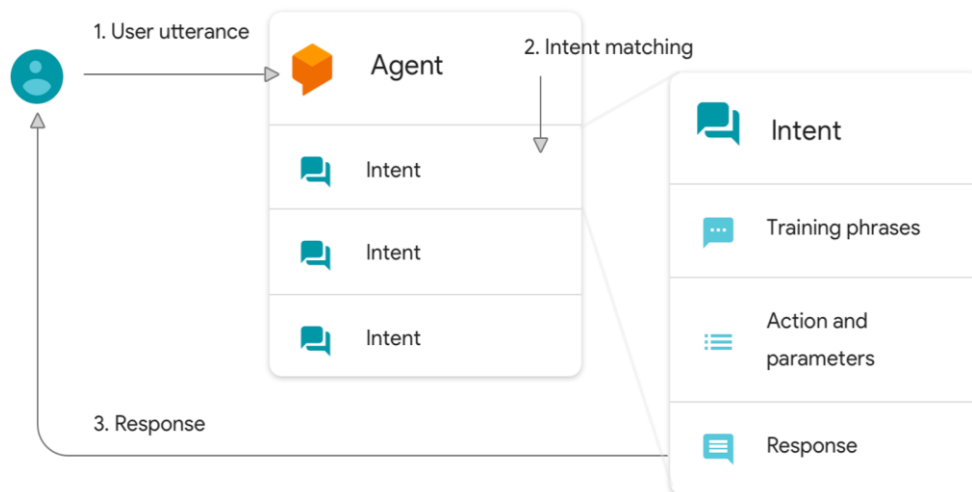


Figure 2 Dialogflow Process Flow

Figure 2 above illustrates a system consisting of three main components: user utterance, intent matching, and agent response. The user acts as an actor who provides input to the agent. The agent, which consists of intent and entities, serves as the module that processes the user input. The agent has a sample of Latin data associated with the question and user input. When the agent receives a command from the user, it forwards it to the intent section. In the intent section, the language structure in the conversation is analyzed and tasks are processed based on specific phrases.

2.3. Literature Study

The approach in this research uses a type of research in the form of a literature study. Literature study can be achieved by collecting references or collecting data that already exists and then drawing conclusions about what questions are often asked[17]. The results of the previous frequently asked questions were then used to conclude (1). What are the common questions that are often asked? (2). How should the response be made to answer related common questions. (3). How are the results of the previous system that has been implemented.

Training Phrases	Responses
1. Excuse me	hello, thank you for contacting AdminBot, how can I help you?
2. Good Night	
3. Good afternoon	
4. Good Morning	
5. Hello	
6. Hey	
7. Hello how are you	
8. Assalamualaikum	
	I don't understand, can you repeat it? Sorry, can you repeat that? Repeat again please I don't understand.
1. Is the service open today?	Our services are open every day from 9am to 3pm, if you want more information, please go to the 1st floor, from the entrance on the left there will be a community service counter.
2. What time does the service open?	
1. how to take care of the labeling	pirt licensing is now through OSS.go.id... The important thing is to prepare for the requirements: 1.Brand, 2.Type of food, 3.Composition, 4.Good to use before, 5.Production Date, 6.Production Address (at least the name of the production city), 7.Net weight, 8.PIRT Number, and this is all free..... [] but if you want to ask about PIRT more clearly, please go to the 1st floor, from the entrance of the building on the left there will be a public service counter including PIRT.
2. what are the PIRT requirements	
3. how to take care of pirt	
4. what are the requirements to apply for a pirt	
5. Pirt label requirements	
6. Want to get a PIRT certificate	PIRT certificate, please go to the SDK field on the 10th floor, you can meet Mrs. Putri or Mr. Didik.
1. Okay	okay brother, thank you for contacting AdminBot, if you still have questions, you can directly contact our contact person, the number is at the bottom. HAVE A NICE DAY :)
2. good, I understand	
3. okay, thank you	
4. ok	
5. thanks	

Figure 3 General Question Result

in Figure 3 above is the result of applying a literature study from a system that existed some time ago that displays some general questions and answers to questions that customers often ask about related research.

2.4. Chatbot Model Flow Design

A design that describes the chatbot workflow designed using related methods so that the chatbot can be realized in accordance with the planned expectations. In this flow there is an explanation of how the chatbot created using this dialogflow works, starting from the user inputting a question, then how

the chatbot processes the question so that it can display an answer that matches the question asked.

If the question already exists in the Dialogflow dataset, the system will provide the corresponding answer. However, if the question is not found, the system will provide a smalltalk answer instead.

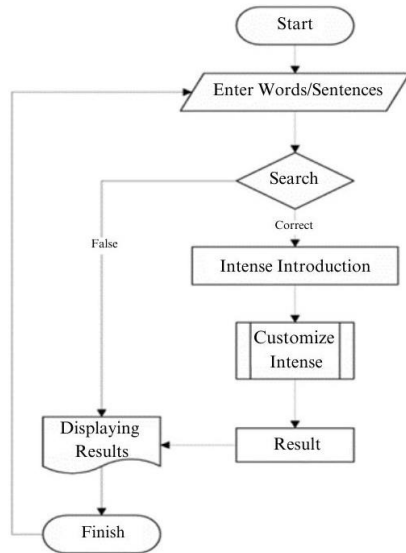


Figure 4 Chatbot System Flow Using Ruled-Base

In Figure 4, is an explanation of a chatbot system that uses the ruled-base method to answer user questions. Initially, the admin enters data on common questions that are often asked by customers. When a user enters a question through the chat field, the system will search for keywords in the question.

2.5. Testing Design

Tests carried out on this chatbot use the functional testing method (black box testing). This method focuses on testing the functions of the chatbot which aims to ensure that the rules set in the chatbot can work and produce results as they should. The test scenario will be carried out by testing each menu displayed on the chatbot. Each menu will be tested by entering different inputs and observing the output results. A test is considered successful if the output results obtained are in accordance with expectations and the design of the rules applied. Conversely, if the output results do not match expectations, then the test is considered a failure[18].

3. RESULT AND DISCUSSION

3.1 Software System Implementation

Creating software that is fit for purpose requires several factors to be met, known as software requirements. These factors determine the functionality, performance, and usability of the

software to be created. Some of the supporting software that must be installed are as follows:

Table 1 Hardware Specifications

Spesifikasi	Deskripsi
Computer	MSI
Prosesor	i7-10750H
RAM	12gb
Harddisk	512gb
VGA	Intel® UHD Graphics

Table 2 Software Specification

Specifications	Descriptions
Operating System	Windows 11 Home
Platform	512gb
Web Server	8gb
DBMS	10/100Mbps
Browser	Google
Desain Web	Intel® UHD Graphics

Table 1 shows the hardware used to design this chatbot to completion, while Table 2 contains the software specifications used in this study.

3.2 Implementation Website

This website will be useful for additional services to food certification license applicants, in order to make it easier for Semarang City Health Office employees to be helped in the public service sector. With the chatbot that will be added to the website so that later license applicants can open this website and if there are questions, they can ask via the chatbot on the bottom right.

Website view in Figure 4 is a website view belonging to the Semarang City Health Office of Pharmacy and Health Supplies which will be the place for research on the chatbot feature using dialogflow that I will develop on this website.

3.3 Implemetation of Rule-Based Method

The rule-based method is an approach to decision-making or information processing that relies on a set of predefined rules. In this method, decisions or actions are taken based on conditions or patterns that match predefined rules.

In its application we must determine what questions are often asked as in the collection of answers that have been discussed in the literature study that has been discussed.

Then inputting the answers that will be issued when there are related questions must be in accordance with the questions asked.

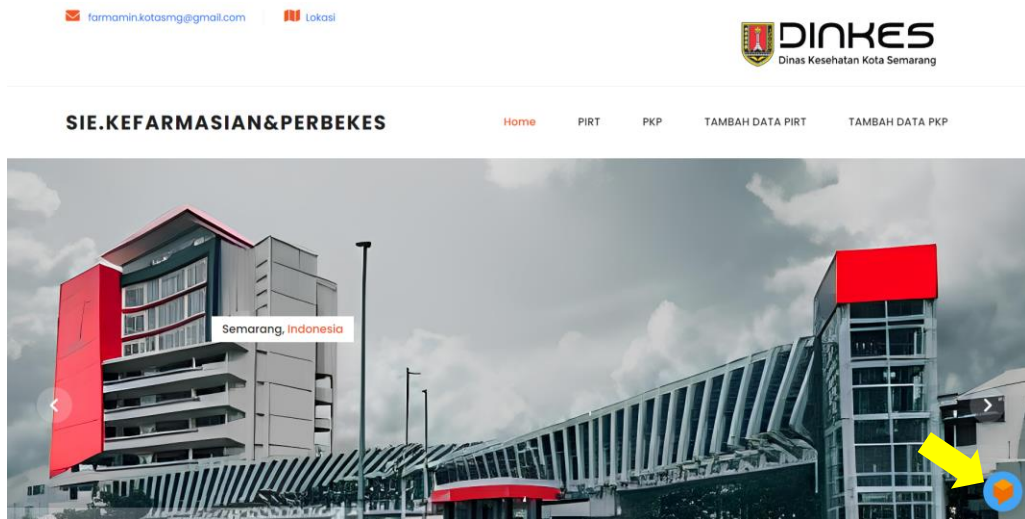


Figure 5 Dashboard Website

Excuse me
Good Night
Good Afternoon
Good Morning
Hello
hey
Hello how are you
Assalamualaikum

Figure 6 General Question Rules

Text Response	
1	hello, thank you for contacting AdminBot, how can I help you?

Figure 7 General Responses Rules

Figures 6 and 7 are examples of the application of rule-based methods in making this system, later, all questions will be input according to the rules that should be and the answers are also in accordance with the existing response rules.

3.4 Implementation of Dialogflow

Dialogflow is the place where this chatbot is created which will later be implemented on an existing website. the way this dialogflow works later the user will send a message which will then be processed by the system from dialogflow then a response will be determined which will later be issued to answer user questions.

While making a chatbot from dialogflow starts from the inside, there are several parts to the system

part of dialogflow, including: agent, intent, entity, training phrases and responses.

The first step is that we must determine the agent where we make the name of our project, then determine what intent we will create, after that in the intent we create an entity that contains specific information, and we create training phrases for what questions the system will answer, and the responses we give according to the answers that will be issued if the user asks the questions in the training phrases.

3.4.1 Default Welcome Intent

The default welcome intent is the first interaction between the user and the chatbot. When the user starts a conversation with the chatbot, either by giving a greeting such as “Hello” or “Excuse me”, the chatbot will respond with the appropriate answer based on the training phrases that have been set.

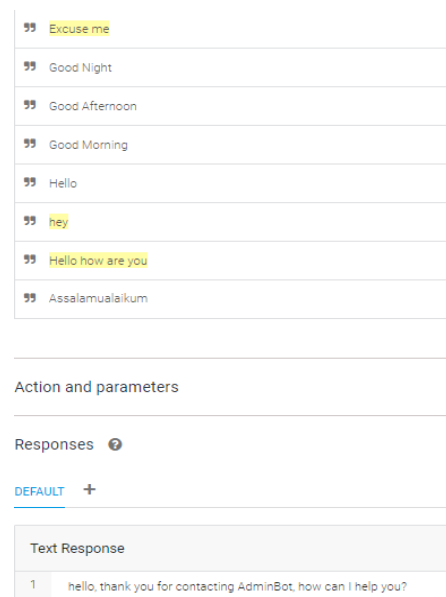


Figure 8 Default Welcome Intent Training Phrases

Figure no 8 shows what questions and answers the user will be asked and the answers that will be issued.

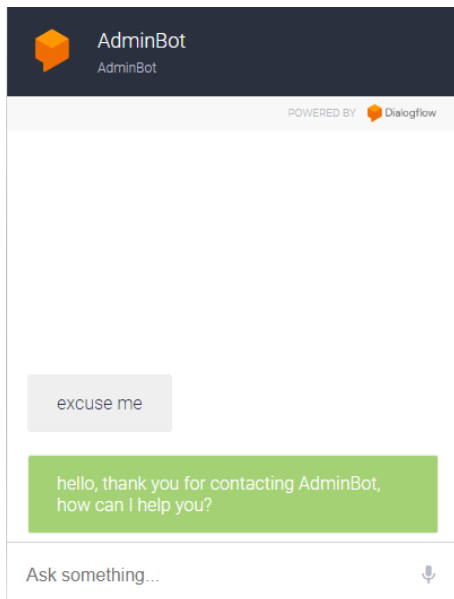


Figure 9 Default Welcome Intent Result

In Figure 9 is an example of implementing the default welcome intent where when there is an opening question, the chatbot will reply according to the answer that has been inputted.

3.4.2 Default Fallback Intent

Default fallback intent is a mechanism in the chatbot that serves to handle situations when users provide input that is incomprehensible or does not match the intent that has been defined. In this situation, the chatbot will provide an error message to the user to inform them that their input cannot be processed.

Text Response	
1	I don't understand, can you repeat it?
2	Sorry, can you repeat that?
3	Repeat again please
4	I don't understand.

Figure 10 Default Fallback Intent Training Phrases

Picture no 10 shows the answer that will come out if there is a question that does not match the question that has been entered or out of the question that has been set.

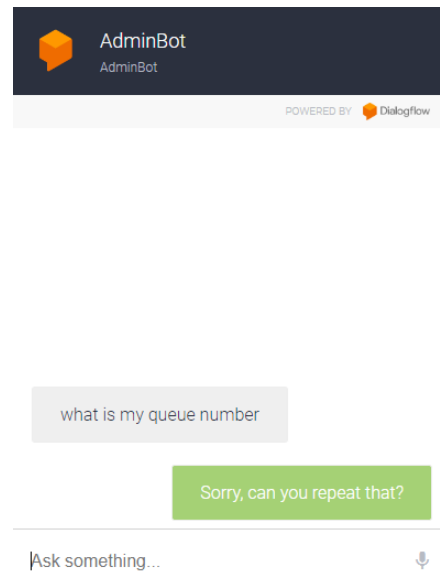


Figure 11 Default Fallback Intent Result

In Figure 11 is an example of default fallback intent, where if there is a question that does not match the answer that has been inputted into the system, the chatbot will automatically issue a reply that leads to repeating the question until the chatbot can read the question and can reply to the question according to the appropriate answer.

3.4.3 Opening Hours Intent

Opening Hours Intent is a response when a user asks about opening hours, the chatbot will respond with related information, such as today's opening hours, opening hours for a particular day, or overall opening hours. Examples of sentences that trigger this intent are "Is the service open today?", or "What time does the service open?".

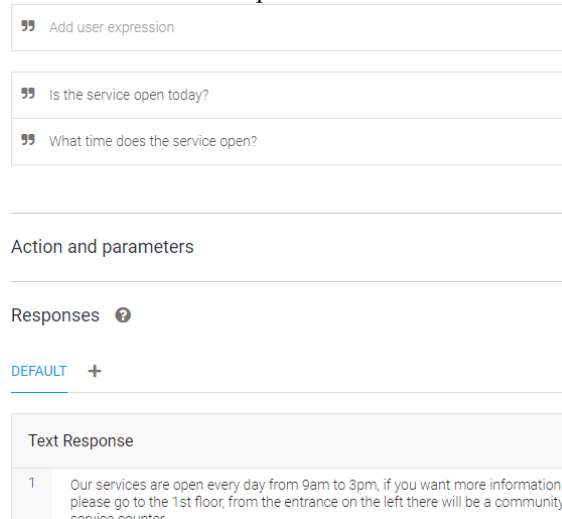


Figure 12 Open Hours Intent Training Phrases

Figure 12 shows where the training phrases opening hours intent which is a place to input questions about opening hours, where later the answers that will answer related to opening hours

questions will also be inputted so that if there are questions about opening hours, the answers that will come out are answers that will answer related to service opening hours.

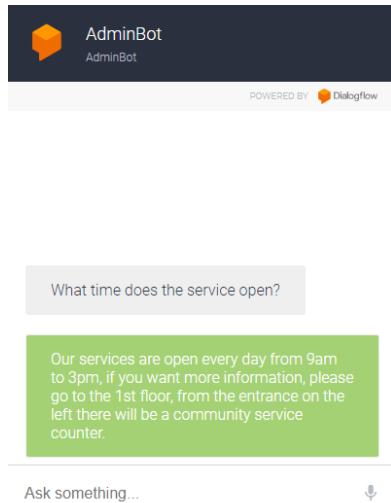


Figure 13 Open Hours Intent Result

Figure 13 above is an example of how the chatbot works to answer general questions about opening hours, the answers listed above are answers that have been inputted to the system if there are questions about opening hours.

3.4.4 Label and PIRT Certificate Intent

PIRT Label and Certificate Requirements Intent is a response to user sentences related to “requirements” and “certificate”. When the user asks “what are the requirements to apply for a pirt”, the chatbot will provide a list of answers containing information about the requirements needed. PIRT itself stands for “Pangan Industri Rumah Tangga” which is the jobdesk of this field.

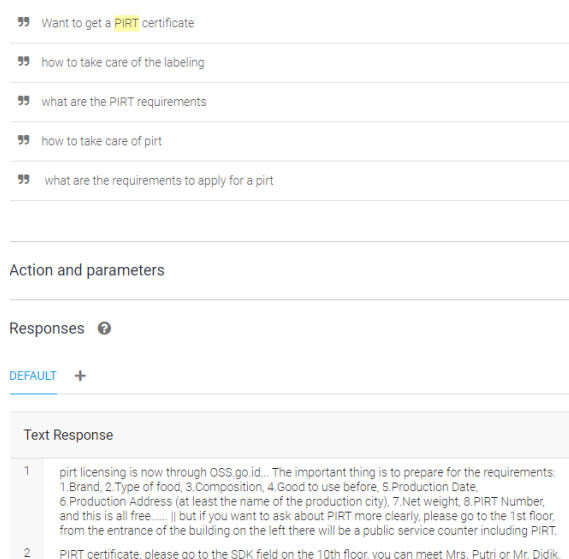


Figure 14 Label and PIRT Intent Training Phrases

Figure 14 is where the training phrases of Label and PIRT Certificate Intent which is a place for questions about the requirements for obtaining a PIRT certificate and questions about where to collect a finished PIRT certificate, the answers that have been inputted also contain information about questions related to information on PIRT requirements and retrieval.

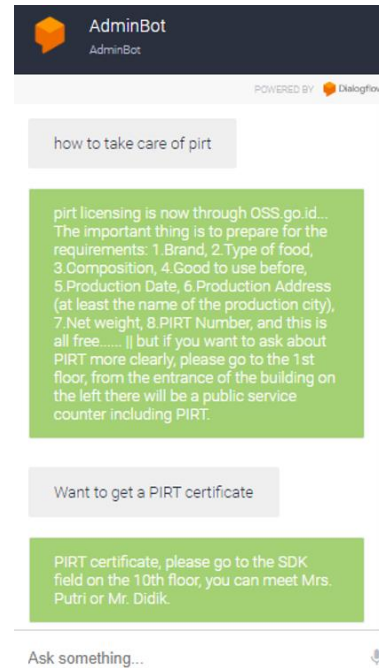


Figure 15 Label and PIRT Certificate Intent Result

Figure 15 is a response that has been inputted to the system that will come out of questions related to the requirements that must be brought when applying for a PIRT license and also displays an answer if the user asks where to take the certificate which later the chatbot provides a response regarding information related to the certificate from the results of the PIRT licensing test that has been carried out.

3.4.5 Closing Intent

Closing Intent is a closing response from questions that have been answered all, the response from the chatbot that closes the conversation from the last question such as: “thank you”, ‘okay’, ‘good, I understand’. Then the chatbot will answer according to the sentence that has been entered in the dialogflow.

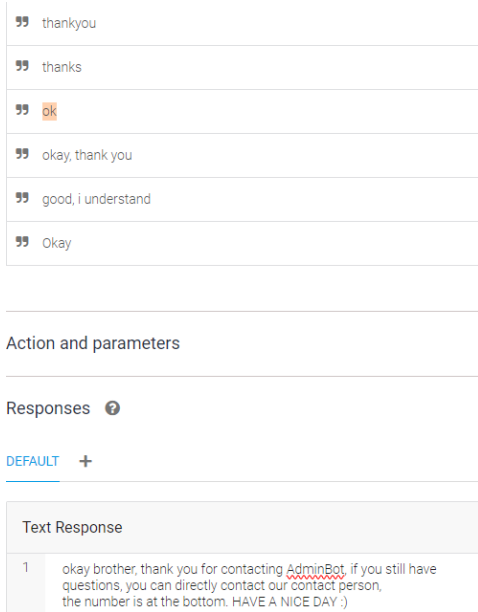


Figure 16 Closing Intent Training Phrases

Figure 16 explains where the closing intent training phrases is the sentence ending answer after the user says a word that is supposed to be the final word in using this chatbot.

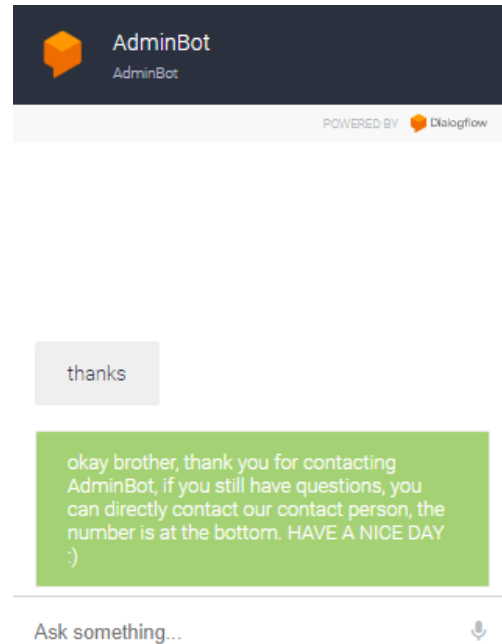


Figure 17 Closing Intent Result

Figure 17 is the implementation of the results of trying to enter questions and answers that are in accordance with what has been inputted in the closing intent training phrases where the chatbot responds with a closing sentence which also contains a solution sentence if there are still questions can be directed to this website there is a contact person number if you want to communicate more deeply.

3.4.6 Testing Conversation Bot

Testing Conversation Bot is a collection of questions and a collection of answers to the creation of this chatbot which comes from a literature study of pre-existing systems, containing general questions and answers that match the intent of the question being asked.

Table 3 Testing Conversation

Name	Intents	Training Phrases	Responses	Observation
ReactPageAgent	Default Welcome Intent	<ol style="list-style-type: none"> Excuse me Good Night Good afternoon Good Morning Hello Hey Hello how are you Assalamualaikum 	hello, thank you for contacting AdminBot, how can I help you?	Bot replay correctly
ReactPage Agent	Default fallback Intent		I don't understand, can you repeat it? Sorry, can you repeat that? Repeat again please	Bot replay correctly
ReactPageAgent	Open Hours Intent	<ol style="list-style-type: none"> Is the service open today? What time does the service open? 	Our services are open every day from 9am to 3pm, if you want more information, please go to the 1st floor, from the entrance on the left there will be a community service counter.	Bot replay correctly

ReactPageAgent	Label and PIRT Certificate Intent	<ol style="list-style-type: none"> 1. how to take care of the labeling 2. what are the PIRT requirements 3. how to take care of pirt 4. what are the requirements to apply for a pirt 5. Pirt label requirements 6. Want to get a PIRT certificate 	<p>pirt licensing is now through OSS.go.id... The important thing is to prepare for the requirements: 1.Brand, 2.Type of food, 3.Composition, 4.Good to use before, 5.Production Date, 6.Production Address (at least the name of the production city), 7.Net weight, 8.PIRT Number, and this is all free..... but if you want to ask about PIRT more clearly, please go to the 1st floor, from the entrance of the building on the left there will be a public service counter including PIRT.</p> <p>PIRT certificate, please go to the SDK field on the 10th floor, you can meet Mrs. Putri or Mr. Didik.</p>	<i>Bot replay correctly</i>
ReactPageAgent	Closing Intent	<ol style="list-style-type: none"> 1. Okay 2. good, I understand 3. okay, thank you 4. ok 5. thanks 	<p>okay brother, thank you for contacting AdminBot, if you still have questions, you can directly contact our contact person, the number is at the bottom. HAVE A NICE DAY :)</p>	<i>Bot replay correctly</i>

In table 3 is Testing Conversation Bot which is important, because an effective chatbot requires the ability to understand and respond to user questions properly. The testing conversation bot table is here as a tool to test and improve the chatbot's ability in this regard.

The Conversation Bot Testing Table provides an organized structure for testing different types of intent and sentences used by users. By using this table, chatbot developers can: ease testing, improve consistency, ease documentation. Therefore, the testing conversation bot table is an important tool for chatbot developers to ensure that their chatbot functions properly and provides a positive interaction experience for users.

4. DISCUSSION

The literature study method using chatbot examples that have been carried out in previous systems and applied to the creation of this chatbot, has also been applied in previous research which also built a public service mediated using chatbots, the literature review method and case studies in research conducted by Tendai Makasaki, et al[19]. The case study conducted is to examine examples of chatbots that have been carried out in various countries which aim to illustrate how public service values can be integrated and applied through chatbots. Then development is carried out based on the results of the review and case studies that can be realized in a chatbot. The results showed that many were helped by the presence of chatbots in public services and created a sense of security towards the government.

Development of the use of chatbots that help answer general questions of users who will make PIRT by using the Dialogflow platform which will be embedded on the PIRT website. General questions that will be entered are questions that are often asked by users, then several revisions and additions of phrases will be made to improve response accuracy, have also been researched by Simon Pranata and Evialen Surijati[20]. The

research discusses the development and testing of a chatbot named MULbot that helps answer general questions of library users using the Dialogflow platform.

In this research, the method used is to integrate MULbot into Dialogflow. MULbot populates the Dialogflow "Agent" with questions and synonyms in "Intent", as well as related answers in "Response". The integration is done through a web demo and a chatbot that has been tested in several scenarios so that it has made several revisions and added phrases to improve the accuracy of the responses, to ensure accuracy. This chatbot is designed to help users get library information, such as book descriptions, borrowing status, and new member registration. This is expected to reduce the librarian's workload.

The results showed that the chatbot was successfully developed using Dialogflow. The addition of phrases improved the accuracy of the chatbot response. However, the chatbot still has limitations in handling mixed languages or many abbreviations, as well as rigid responses. Therefore, this study recommends further development in the field of artificial intelligence (AI) and high computing to improve the capabilities of chatbots in the future.

Previous research that implemented chatbots in Skandiva public services was conducted by Anastasiya Henk and Frode Nilssen[21]. The research conducted is very relevant to what is discussed in this study, where the method used uses the same sample as this study, namely using a recap of a pre-existing sample, and the purpose of this study is the same as the research conducted by Anastasiya Henk and Frode Nilssen, namely to facilitate public services. Development that understands how the use of AI impacts long-term job performance, employee satisfaction, and public service performance. This research also explores how AI can foster creativity and autonomy for service workers.

The method used was selective theoretical sampling obtained from three sources, namely: interviews, internal documents, and available data.

This method is useful to understand how AI can transform service work, improve intuitive ability and empathy. This research has been conducted and produced some important findings related to the influence of AI on public service work, the level of task meaningfulness and creativity of public service workers after the introduction of chatbots, and the ease of public customers in obtaining services.

5. CONCLUSION

This chatbot is here to replace human conversations in the service process for PIRT (Trade Business License for Household Industry Food) applications. This chatbot will provide responses according to user input. The response is based on data that has been trained in Dialogflow.

In the development of this chatbot, it can be useful to assist the contact person of the Pharmaceutical and Health Service Division in solving PIRT application service problems and can provide a fast and accurate response according to user data input so as to reduce the contact person's workload and improve service efficiency. The easy use of the chatbot is only by asking what you want to ask the chatbot which will then be responded to according to the matching data, and can also be accessed anytime, anywhere so that it saves time and costs is an advantage that can be obtained so that it can increase satisfaction in public services.

This research has a huge impact on people who are looking for information about PIRT by using a shorter time than before, and this impact is also felt by workers or admins who previously answered questions from the public very much and complicated, now it is very light with this chatbot. The obstacle in writing this research is that the words entered are limited, so the range of questions is not so much due to the Rule-Based method used in this research.

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