KOMPUTASI: JURNAL ILMIAH ILMU KOMPUTER DAN MATEMATIKA
Vol. 20 (2)(2023), 101-111 p-ISSN: 1693-7554, e-ISSN:2654-3990

Chatbot PTIPD Customer Care Center Service using Dialogfow

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Abstract

Chatbot research is a unique innovation in the development of Artificial Intelligence and has promising prospects in the field of Education. One form of information service available at the university is the Customer Care Center (C3) PTIPD UIN Suska Riau, which is responsible for handling problems submitted by students. However, with so many questions or problems submitted to the PTIPD Customer Care Center, it is difficult for the PTIPD Customer Care Center to respond to student questions submitted, the service becomes ineffective and the response to the answers to the problems submitted becomes late. To overcome this problem, chatbot development was carried out for PTIPD UIN Suska Riau Customer Care Center Services using Dialogflow to improve services and overcome existing problems. Dialogflow as conversation development platform that uses natural language processing (NLP) to understand and interpret user intent in conversations. Through User Acceptance Test (UAT) testing, the chatbot managed to achieve an acceptance rate of 84% overall. This shows that users, in this case, students respond positively to the use of chatbots in PTIPD Customer Care Center services. In addition, Usability Testing was also conducted to evaluate the level of usability of the chatbot. Based on this test, the chatbot achieved a score of 76, which indicates a good level of usability in interaction with users. The test results illustrate that the chatbot at the Customer Care Center PTIPD UIN Suska Riau has provided a positive user experience.

Keywords: *Chatbot; Artificial Intelligence; Dialogflow*

1. Introduction

Based on Research [1], the competitive world in the era of society 5.0 currently uses opportunities that implement Artificial Intelligence (AI). Various kinds of intelligent agent technologies that realize human-machine interaction by Artificial Intelligence (AI), one of which is Chatbot. Chatbot is able to record customer input data and offer customized services in real time [1]. This makes chatbots widely used in various fields and industries. Chatbots have become increasingly trending in recent decades and are developed for technology on leading media platforms and laboratory research. Currently, transaction communication on the world's largest social platform is changing with the Facebook Chatbot, and approximately 100,000 Chatbots have been used on Facebook Messenger [2]. Then, there are studies that review the top 100 articles related to chatbots and get research results that the development of chatbots has changed by offering conversation schemes to achieve a better method of online communication [3]. Chatbot-related research is increasingly

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Received: 1 July 2023, Accepted: 2 July 2023 and available online 30 July 2023
https://doi.org/10.33751/komputasi.v20i2.8281

promising opportunities to improve customer service in the field of e-commerce and e-service and to improve service performance and meet customer expectations [4]. Chatbot research for the field of customer service has been carried out previously by [5], who developed a text and voice-based CS chatbot for the Order Management System (OMS) and successfully resolved customer service problems, chatbot research conducted is still limited to ordering and cannot yet respond using voice features [5]. Furthermore, chatbot research for customer service at PT Dian Prima Jayaraya by [6] which was built using Dialogflow as its platform and obtained results that overcame the problems faced by the Customer Service team to answer incoming questions [6].

Chatbots are becoming a trend in education, as evidenced by chatbots having the potential to change methods of learning and extracting information in human behavior [7]. Chatbot research for the campus environment has been carried out before, including by [8], Chatbot was developed with Natural Language Processing (NLP) technology and the Python programming language which provides efficient services and responds to new student questions in 24 hours [8]. In chatbot research on campus, especially C3 PTIPD, previously conducted [9], in the field of education, especially in the Customer Care Center (C3) on campus, it is hoped that it can help students in providing solutions and even solving student problems. Research on chatbots was conducted at UIN SUSKA RIAU, especially to help C3 PTIPD who had difficulty responding to student questions one by one at the official C3 PTIPD contact. The result is that Chatbot using the Boyer Moore method can provide answers based on what is desired with an answer accuracy rate of 96% and the level of system acceptance testing with the User Acceptance Test (UAT) [9]. Other research by [10] with chatbot using Hidden Markov Model (HMM) and Artificial Intelligence Markup Language (AIML) obtained 55% accuracy for 30 answers by studying 150 categories of questions [10].

The research was conducted by implementing a chatbot using Dialogflow to get better results than previous research. Which some studies such as [6], [11], [12] have proven the advantages of using Dialogflow to create a customer service chatbot.

2. Methods

2.1. Research Stages

In the research, using the research stages to build the PTIPD UIN SUSKA RIAU Customer Care Center (C3) Chatbot application which can be seen in Figure 1.

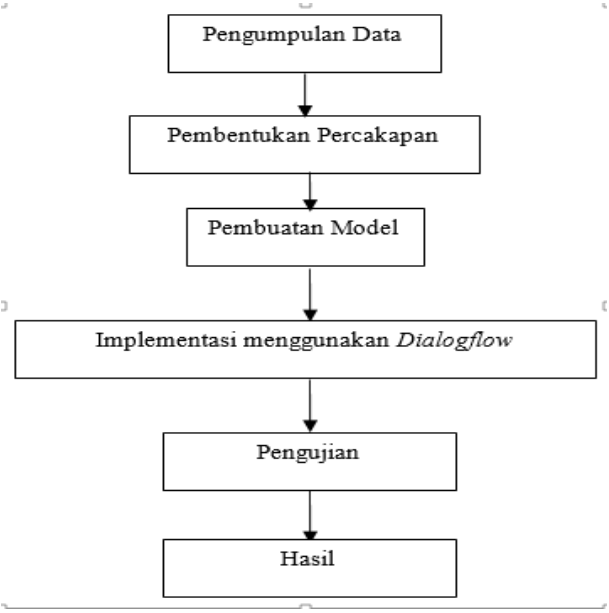

Figure 1. Research Stages

From the stages in Figure 1, it can be described as follows:

1. Data collection: what is done is to obtain information related to the research, namely questions received by the C3 PTIPD UIN SUSKA RIAU and previous research data.
2. Conversation Formation: what is done is to form a conversation flow from the questions received by C3 PTIPD UIN SUSKA RIAU.
3. Model Building: what is done is to determine the agent, intent, entity from the conversation flow that has been obtained previously.
4. Implementation using Dialogflow: what is done is to apply the flow of conversation with the intent and entity that has been obtained previously into Dialogflow. Then, it can be accessed using the Telegram Platform.
5. Testing: what is done is testing using User Acceptance Test (UAT) and Usability Testing to UIN Suska Riau students.
6. Results: The output of the final stage of the research with the Customer Care Center Chatbot Application (C3) PTIPD UIN SUSKA RIAU implemented in Dialogflow.

2.2. Dialogflow Natural Processing Language

In this research, the chatbot matches intent and provides answers with the help of dialogflow as follows:

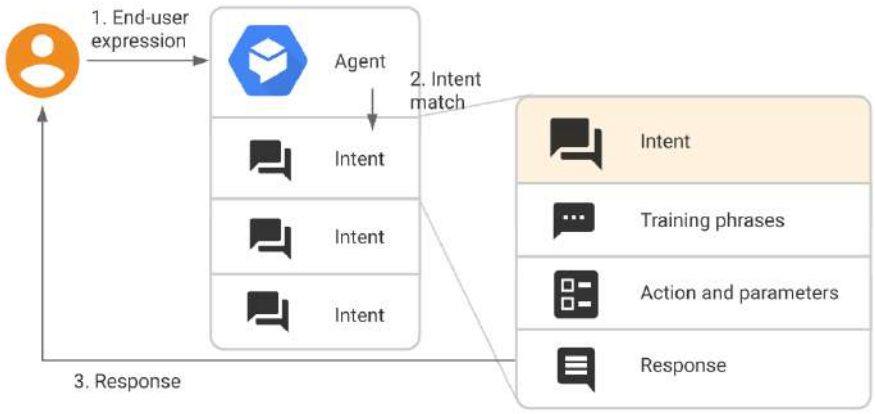

Figure 2. Dialogflow Intent Matching

In Figure 2, Dialogflow is a conversation development platform that uses natural language processing (NLP) to understand and interpret user intent in conversations. Intent matching is one of the important stages in conversational processing, where Dialogflow plays an important role in matching user statements with defined intent [6], [12]. Intent matching in Dialogflow requires several steps. First, intent is created and example statements are given. After that, the Dialogflow model is trained to learn the patterns and features associated with each intent. Dialogflow processes the user-entered text to identify the intent behind the statements. Next, natural language processing algorithms and techniques are used to adapt the user's statement to the predefined intent. Actions related to the intent are executed once the intent is found, such as displaying an answer or sending a request to the backend.

3. Result and Discussion

3.1. Literature Review

Research to prove the feasibility of chatbots has been carried out by several researchers, including, Web-based chatbot research using Dialogflow conducted by [13] successfully developed a

chatbot for the Binjai Primary Tax Office in responding to incoming questions in accordance with the training phrase carried out [13]. The chatbot research used the Deep Learning method with a model that detected more than fifty types of questions from user input with 97.1% accuracy on the test set and applied to the official admission Fanpage of the National University of Economics on the Facebook platform, the most famous social network in Vietnam. This research shows a detailed guide on how to build an AI chatbot from scratch, and the techniques we used, which can be applied to any language globally by [14]. Furthermore, Chatbot with the Neural Network method for Muhammadiyah University, especially PMB, which gets the results of an average accuracy rate of 0.8 [15]. Then research using the Knuth Morris Pratt method by researchers [16] obtained a chatbot training dataset consisting of 193 questions grouped into 18 tags with Black Box Testing techniques for chatbot testing using 100 questions that have an 86% accuracy rate in answering user questions [16].

Research by comparing methods on chatbots has been done a lot, this is done to find results quickly but has high accuracy. Here are some studies including, researchers who compared the KMP, BM and Franek Jennings Smyth (FJS) methods by [17] using the MapReduce Framework obtained results that prove KMP is superior to BM in short patterns, but BM is superior to KMP in longer patterns, but Hybrid KMP-BM or FJS outperforms KMP and BM in short and long patterns [17]. Then, researchers who compared the Knuth Morris Pratt method with Bayer Moore using the Exponential Comparison Method (MPE) by [18] found that the Knuth Morris-Pratt algorithm is faster than the Boyer-Moore algorithm for the word search process [18]. Research comparing the two methods was also conducted by [19] which obtained different results, where from the total ECM score that the BM algorithm is 0.55% superior to KMP as evidenced by the BM search time is 37.9%, and the KMP algorithm is 62.1%, then the search memory usage for the KMP algorithm is 50.6%, and the BM algorithm is 49.4% [19]. Furthermore, still related to the comparison of the two models by implementing into Java and Java Microbenchmark Harness to evaluate the execution time of the method using a number of experimental test scenarios and the results obtained that the BM algorithm outperforms the KMP algorithm in all test scenarios [20].

3.2. Chatbot Architecture

The Chatbot Architecture has stages to integrate the PTIPD C3 Service Chatbot with students who want to ask questions as follows.

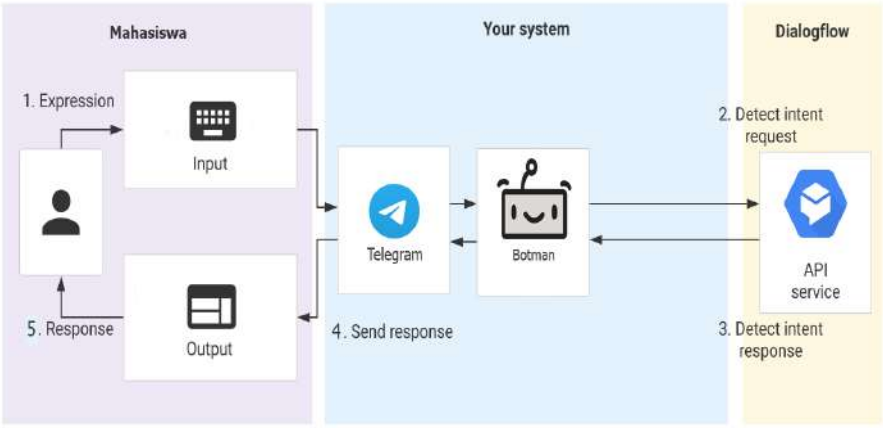

Figure 3. Architecture of Chatbot

In Figure 3, we can see the design and flow of the stages of student interaction with the chatbot and apply the concept of Natural Language Processing which identifies and then responds with specific intent. There are users, namely students, who input or output through the Telegram application, BotMan, Webhook, and Dialogflow. Students use the Telegram application to send messages in the form of questions, and BotMan as Middleware that connects Telegram with Dialogflow. Webhook plays a role in receiving input from Telegram to BotMan. After Dialogflow

processes the information needed, BotMan will forward the appropriate response to Telegram so that students get a reply via Telegram.

3.3. Dialogflow

Dialogflow registers the intent that is used according to the analysis of the conversation pattern to recognize and respond to questions that enter the chatbot.

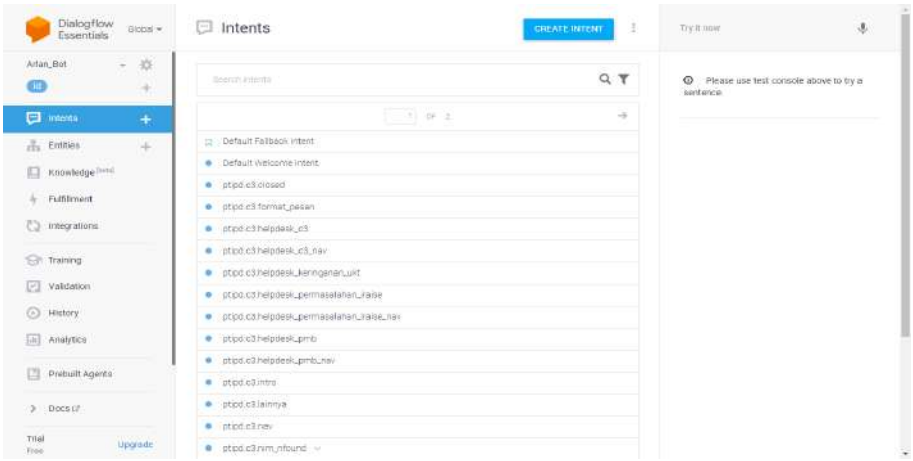

Figure 4. Intent

3.4. Conversation Flow

In Chatbot Dialogflow there are several conversations, namely:

Table 1. Table Conversation

Conversation	Used for
Format Pesan	Melihat format pesan untuk menyampaikan permasalahan
Reset Gmail Dosen	Mengajukan reset password akun gmail pegawai atau dosen
Reset Mahasiwa Email	Mengajukan reset password akun email mahasiswa
Reset E-learning	Mengajukan reset password akun E-elearning mahasiswa
Reset iRaise	Mengajukan reset password akun iRaise mahasiswa
Helpdesk iRaise	Mengajukan permasalahan terkait iRaise
Helpdesk C3	Mengajukan permasalahan ke C3
Reset Presensia	Mengajukan reset presensia pegawai atau dosen
KRS	Mengajukan permasalahan terkait KRS
UKT	Mengajukan permasalahan terkait UKT
Helpdesk Siasy	Mengajukan permasalahan terkait Sistem Registrasi Mahasiswa baru
Helpdesk PMB	Mengajukan permasalahan terkait PMB
Lainnya	Mengajukan permasalahan secara umum

In Table 1, there is a conversation for submitting a password reset request on the Integrated Academic Information System (iRaise) UIN Suska Riau account. The following is the flowchart conversation for iRaise password reset request.

3.5. Implementation

In DialogFlow, register the intent for the iRaise password reset conversation according to the data used. In this research, the intent name is stored as “ptipd.c3.reset_iraise” this is to specify that

Figure 5. Flowchart Conversation reset password iRaise

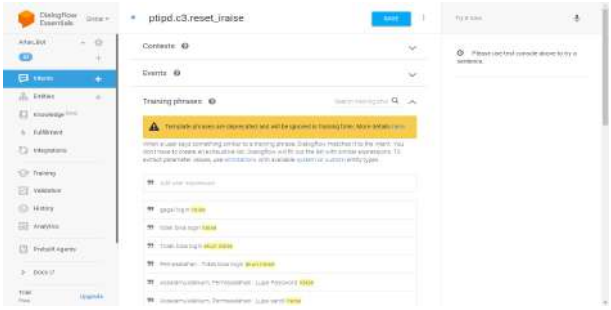

Figure 6. Create intent “ptipd.c3.reset_iraise”

incoming queries related to iRaise password reset will be defined as intent “ptipd.c3.reset_iraise”. Here’s a figure of creating intent “ptipd.c3.reset_iraise”.

In addition, the research also registered custom entities to assign iRaise as the keyword for the intent "ptipd.c3.reset_iraise" with the name "account_iraise" as shown in Figure 6.

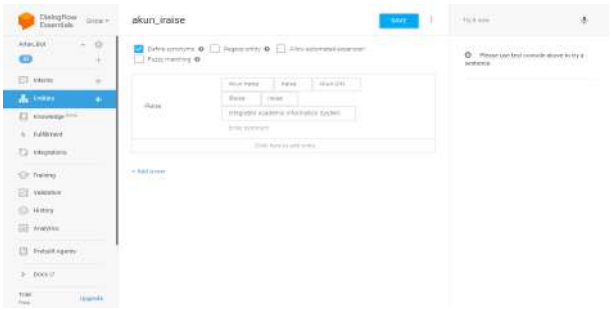

Figure 7. Create the entity "akun_iraise".

On Telegram, students who ask problems related to resetting iRaise accounts by using commands or directly asking questions and getting responses designed from the data obtained. As shown in Figure 7. BotMan as middleware will match the intent that will be used to respond to the answer related to the intent "ptipd.c3.reset_iraise" as follows.

```
$dialogflow = DialogFlow::create('en');
$botman->middleware->received($dialogflow);
$botman->hears('(.*)', function (BotMan $bot) {
    $extras = $bot->getMessage()->getExtras();
    $apiReply = $extras['apiAction'];
    if($apiReply == 'reset_iraise')
    {
        $apiReply = $extras['apiReply'];
        $bot->reply($apiReply);
        $bot->startConversation(new ResetIraise());
    }
```

Figure 8. BotMan middleware for intent "ptipd.c3.reset_iraise"

Students who submit problems related to iRaise password reset will get a response set by BotMan and enter into conversation. In Figure 9, shows the Chatbot response to students via Telegram.

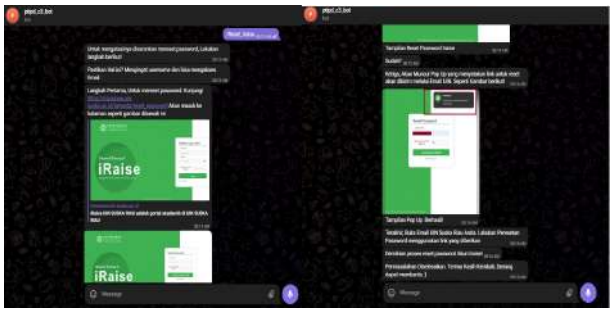

Figure 9. Telegram Chatbot Answers

3.6. User Acceptance Test

User Acceptance Test or UAT is a test conducted to assess whether the chatbot created has met the needs of students at UIN SUSKA RIAU. The UAT questionnaire consists of 10 questions whose answers are 1 (Sangat Kurang Baik). 2 (Kurang Baik), 3 (Netral), 4 (Baik), 5 (Sangat Baik). The following are the results of tests conducted using UAT:

Table 2. Table of UAT Criteria

Scale	Score	Percentage
Awful	1	0-19
Poor	2	20-39
Okey	3	40-59
Good	4	60-79
Excellent	5	80-100

Table 3. Table of Student UAT Data

Question	5	4	3	2	1
Ease of navigating chatbots on telegram?	13	12	6	0	0
Chatbot response/response according to problem and informative?	12	13	6	0	0
Chatbot solves the problem well?	10	12	9	0	0
Interesting and realistic chatbot?	9	16	6	0	0
Initial interaction with the chatbot is good?	17	6	5	3	0
Easy to interact with the chatbot?	13	13	4	1	0
Chatbot running well?	9	17	5	0	0
Satisfaction with chatbots?	13	12	6	0	0
Chatbot makes it easier for students to solve problems?	13	13	5	0	0
Will you and other students be helped by this chatbot?	16	11	4	0	0

Table 4. Table of UAT answer analysis

Question	subtotal	Average	Percentage
Ease of navigating chatbots on telegram?	131	4.225806452	84
Chatbot response/response according to problem and informative?	130	4.193548387	83
Chatbot solves the problem well?	125	4.032258065	80
Interesting and realistic chatbot?	127	4.096774194	81
Initial interaction with the chatbot is good?	130	4.193548387	83
Easy to interact with the chatbot?	131	4.225806452	84
Chatbot running well?	128	4.129032258	82
Satisfaction with chatbots?	131	4.225806452	84
Chatbot makes it easier for students to solve problems?	132	4.258064516	85
Will you and other students be helped by this chatbot?	136	4.387096774	87
Total			84%

Calculation of the results of the User Acceptance Test tested on 31 student respondents at UIN Suska Riau obtained an overall result of 84% against the PTIPD C3 Service Chatbot, which is categorized as Very Good based on Table 2.

3.7. Usability Testing

Usability Testing is a test conducted to test student interactions with the PTIPD UIN Suska Riau C3 Service Chatbot. This test was also carried out on 31 student respondents, the following tests:

Table 5. Table of Usability Testing Criteria

Category	Grade	Score
Excellent	A	>80.3
Good	B	68-80.3
Okay	C	68
Poor	D	51-68
Awful	F	<51

Table 6. Table of Usability Testing Analysis

Respondens	Point	Score
1	39	98
2	32	80
3	35	88
4	24	60
5	36	90
6	37	93
7	31	78
8	25	63
9	27	68
10	34	85
11	28	70
12	35	88
13	30	75
14	26	65
15	37	93
16	31	78
17	23	58
18	20	50
19	40	100
20	24	60
21	20	50
22	24	60
23	37	93
24	35	88
25	32	80
26	28	70
27	20	50
28	34	85
29	35	88
30	29	73
31	29	73
Total		76

To get the results, the number of scores is multiplied by 2.5 as a general convention in calculations [21]. Furthermore, looking for the average to get the final result is 76. From the results of Usability Testing calculations conducted on 31 student respondents at UIN Suska Riau, a score of 76 was obtained which included the Good or Grade B category in Table 5.

4. Conclusion

From the research conducted regarding the PTIPD UIN Suska Riau Customer Care Center (C3) Service Chatbot, it has the potential to improve student services and efficiency. Positive User Acceptance Test (UAT) test results achieved a chatbot acceptance rate of 84% which shows students accept chatbots as a good source of information but are still below the results of previous research and require improvement. In addition, the test results using Usability Testing achieved a score of 76, which indicates that the chatbot has a good level of usability. Overall, this research provides valuable insight and understanding into the use of chatbots in Customer Care Centers and opens a pathway for the potential of chatbots in education.

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