Optimizing the Customer Service Performance with Using Chatbot by Utilizing Bot Accuracy, Journey Completion Rate, and Customer Satisfaction Score (CSAT)

(Case Study: PT YAI)

THESIS

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AUTHENTICITY STATEMENT

In the name of Allah, I hereby certify that this research is based on my own work except for the citations and summaries in which those are explicit knowledge. If in the future this statement is proved not right and violates the legal regulation of papers and intellectual property rights, I agree to Universitas Islam Indonesia to revoke my bachelor certificate.

Yogyakarta, 19 October 2022



Eky Fasich Trialopa

DEDICATION PAGE

Assalamu'alaikum Warahmatullaahi Wabarakatuh

Praise and gratitude are addressed to the Almighty God, no superpower above Him nor anything shall be worshiped but Him. What I have done here is nothing without His blessing and bestowed knowledge upon me and for that I am grateful. Shalawat and greets are only pointed to the Holy and Last Prophet, Muhammad SAW, because of him that human beings are free now from stupidity and darkness era. He shall be the best role model for all human kinds.

In the process of doing this thesis, the author found few difficulties. These difficulties were covering up the way to delay and to help the author think creatively for overcoming the problems that appeared. However, the author received a number of helps and with these helps the author needs to deliver special thanks to;

1. My mother, Elidya Kartini, who always sends prayers and care, and also blabbers in every second of my life that it turns out to be my nature alarm. Then, my father, Syofian, who believes and supports me in everything that I do.

The author believes in the imperfection of work and it includes this report that someday you may find some amiss. Therefore, the author is looking forward to constructive judgment and positive comments that will help the future of academic research. Thus, the author hopes for these two contributions from the readers.

Wassalaamu Alaikum Warahmatullaahi Wabarakaatuh

MOTTO

"I have had the experience of all bitterness in life, most of all is depending on a human being"

- **Ali ibn Abi Thalib**

ABSTRACT

In the world of Customer Service/Customer Experience with Chatbot technology, the use of metrics is required for industry to measure if the technology used is improved performance or regressive. In this thesis, we use 3 key metrics, Customer Satisfaction Score, Bot Accuracy, and Journey Completion Rate, to measure the proposal flows. Researchers have 3 flows to be measured which include Frequent Questions Asked (FAQs) for CSAT, Live Agent for Journey Completion Rate, and Ticketing Flow for Bot Accuracy. Each flow requires a different approach and method as solutions which encompass the Natural Language Processing (NLP) and categorization for FAQs, the use of memory and database for Live Agent, and the automatic fetching user personal information data to the ticket details and the use of memory in the database for Ticketing flow. As the result, we found that 4 commerce industries show progressive results which happen to achieve the minimum to maximum's percentage respectively as follows 71.81% and 96.74% for the CSAT, 83.48% and 98.98% for the Bot Accuracy, 79.91% and 97.71% for the Journey Completion Rate. Hence, these methods are concluded to be successful after having shown the improvement from the existing percentages and evaluated by the 3 metrics, CSAT, Bot Accuracy, and Journey Completion Rate.

Keywords: CSAT, NLP, Bot Accuracy, Journey Completion Rate, Ticketing Flow, Live Agent.

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CHAPTER I

INTRODUCTION

1.1. Background

AI in the customer service world is one of the booming products nowadays, or used to be known as CS CX world (Customer Service Customer Experience). This field is to automate task, action, and workflows for most of the first layer of problems in the customer based company (B2C). What it looks like in the bigger picture is that a provider company (which provides the CS CX service) establishes the open platform for agent ticketing dashboard and with Chatbot service as added value, like PT YAI. This service of Chatbot simplifies the work of conventional agents in which it is able to do following things, such as filtering / counting the funnel layer of customers (new user, existing user, and even unique user), categorizing the type of problem before connecting to agent, and even helping the customer with providing necessary / helpful information by clicking the frequently asked queries without necessarily connecting and waiting for the live agent to reply. Chatbot has a number of challenges and one of them is allowing the user to ask queries in free format / diverse dialects. In this way, developers as well as the NLP trainer require to add the library of intents and to adjust them into the more suited categories. Hence the Chatbot is able to properly collaborate (Ahmed et al., 2022).

According to Aishwarya Gupta (2022), a chatbot is a virtual person who has been combined with a variety of industrial applications. It is an ecosystem to improve virtual assistants, more functions are gradually added to the current platform. In the world of technology, chatbots like Alice and Eliza have made a difference. It has recently become possible to create lifelike chatbots thanks to advances in machine learning techniques like Deep Learning, Artificial Intelligence, and Natural Language Processing. Neon is a technology created by Samsung Technology and Advanced Research Labs (STAR), a chatbot with emotional intelligence and the capacity to mimic human behavior.

Chatbot is one of the big topics in information technology that generates profitable businesses. Artificial Intelligence (AI) increasingly connects our activities with the analysis

and establishment of intelligent software and hardware, namely intelligent agents. Intelligent agents are able to do a variety of tasks ranging from labor work to sophisticated operations. In the phase of industry revolution 4.0, the use of advanced information and computer technology in the business environment is inevitable. One of the downplay in information technologies that can be used for business profit, especially in the aspect of natural language processing, is *chatbot.* Artificial Intelligence (AI) increasingly connects our activities with the analysis and establishment of intelligent software and hardware, namely intelligent agents. Intelligent agents are able to do a variety of tasks ranging from labor work to sophisticated operations. A chatbot is a similar example from an AI system, the fundamental, also widespread examples of intelligent Human-Computer Interaction (HCI).

In research from Nath and Sagnika (2020), instantaneous and helpful responses are something that service providers really need to be able to offer in order to stay up with rising client expectations. A quicker, simpler option has emerged thanks to recent technological advancements: the chatbot. It automates client contacts to save manual work by simulating human dialogue using artificial intelligence. Chatbots are not just confined to responding to straightforward product-related questions; with the use of machine learning, they are also capable of providing complicated predictive analyses in a condensed amount of time. Even the least technically inclined person may now create a chatbot. Within a company or social network, it can be set and integrated into any messenger. This study covers the capabilities of chatbots and how machine learning has improved their performance.

According to new research by Haristiani (2019), utilizing cutting-edge information and computer technology in educational settings is essential in light of the Industry 4.0 transformation. Chatbots are one of the cutting-edge computing tools that can be utilized for learning, particularly language learning. A chatbot is an artificially intelligent computer program that can conduct audio or text conversations. The goal of this study is to identify and assess the different forms of chatbot artificial intelligence and the potential applications for using them as language learning tools. The information used in this study was gleaned through a survey of the literature on chatbot studies and from observations made using a chatbot-based language learning tool that the author designed.

Chatbots are capable of imitating conversation and amuse users but these are not the only purpose. These conversational aids, namely artificial technology development, are very significant in applications such as business type in Business to Customer (B2C), information retrieval, education, and e-commerce. This research provides a model framework in business/corporation that uses chatbot to secure the order with afterwards the verification process/level will be aided by Live Agent. In research from Adamopoulou and Moussiades (2020), technologies are currently being created. The biggest issue now facing chatbots is their inability to comprehend and produce natural conversation. They can have trouble understanding a word or phrase, which causes misunderstandings and awkward interactions. The most important step in the development of chatbots in the future is probably to improve language generation and comprehension. On the basis of current technology, we don't know how far natural language processing can advance.

Nowadays research presents the conceptual architecture of modern chatbots while also engaging the main platforms for their establishment. Our engagement with the subject so far, satisfies us of the possibility of chatbots and drives us to study them in greater extent and depth. In this research, we implement the model on how the platform in cloud is able to enable chatbots, not only to engage daily basis conversation with customers, but also to create a dynamic context, in hopes that this will create an effective and efficient sequence of duty for business and especially the end-users.

A chatbot is a similar example from an AI system and widespread examples of intelligent Human-Computer Interaction (HCI). Chatbots demonstrate speech non verbal taken from the conversations with the human end-user. A chatbot grasps language to communicate with humans, supported by natural language processing (NLP) and machine learning (ML), both correlated to the discipline of AI. To improve the role of Chatbot in the open Cloud Platform, there are 3 following important keys, as follows *User Expression (Intent)*, *Journey Flow*, and *Customer Satisfaction Score*. These 3 important keys will then be inputted into the Machine Learning program from the back end of the open Cloud Platform to be processed and generate the Chatbot with confidence NLP level, procedural, and interactive Chatbot.

Measuring and modifying Customer Satisfaction (CSAT) for an interactive agent, such as task-oriented spoken dialog systems or chatbots, is crucial in order to understand customer perceptions of an agent's behavior and boost user engagement and retention. When it comes to gauging CSAT, however, an agent frequently relies on explicit consumer input. Users may be distracted by such specific feedback, and it can be difficult to capture continuously changing consumer satisfaction. To overcome this issue, we describe a new method for automatically estimating CSAT from Alexa Prize Socialbot data using auditory and lexical metadata. At both the utterance and conversation levels, we investigate the link between CSAT and sentiment ratings (Kim, Levy, & Liu, 2020).

We take CSAT into account for the metrics in developing the Chatbot improvement. CSAT is generally produced after an agent closes the ticket or Chatbot shows ending information to the customer. Later, the customers are able to choose whether the information provided by either one of the roles satisfies what they seek or not. Thus, we gather data from real Investment Company and gauge the performance by this formula:

- *CSAT Satisfied %* = *Satisfied Amount / Total Ticket*
- *CSAT Not Satisfied %* = *Not Satisfied Amount / Total Ticket*

The CSAT data of 4 months length from 4 companies can be seen in attachment 1 of this paper. The metric of CSAT from these following companies are as follows:

- Company A shows 195 Not Satisfied out of 337 tickets, so it means that this has **57.86%** number of Not Satisfied customers.
- Company B shows 152 Not Satisfied out of 210 tickets, so it means that this has **72.38%** number of Not Satisfied customers.
- Company C shows 363 Not Satisfied out of 653 tickets, so it means that this has **55.59%** number of Not Satisfied customers.
- Company D shows 218 Not Satisfied out of 488 tickets, so it means that this has **44.67%** number of Not Satisfied customers.

No	Company	CSAT
1	A	57.86%
2	B	72.38%
3	C	55.59%
4	D	44.67%

Table 1.1. 4 Months Customer Satisfaction Score for Existing Ticketing Flow

Second metric we can use to evaluate the Chatbot is the Journey flow completion rate. According to Bailey & Almusharraf (2021), in contrast to button response questions, open-ended questions, and fill-in-the-blank template style questions, instructions produced the longest messages and the most specifics for the constructed stories, according to a significant conclusion of our study. This shows that type of chatbot style that we use determines the result from the participation from the customer. Journey flow is the flow that developers design to make the customers easily understand and communicate to the Chatbot in accordance to the customers' behavior, ideally. We are able to measure the effective of the design by checking the Journey Completion Rate %, and the formula to calculate it is:

- Journey Completion Rate % = Journey Completed by User / Total Journey Hit

Table 2 shows the data for the 4 months length for 4 companies:

No	Company	Journey Completed	Journey Hit	Journey Completion Rate
1	A	780	1975	39.49%
2	B	1201	2119	56.68%
3	C	1567	3111	50.37%
4	D	979	2892	33.85%

Table 1.2. 4 Months Journey Completion Rate for Existing Live Agent Flow

- Company A shows 780 Journey Completed out of 1975 Journey Hit, so it means that this has a **39.49%** number of Journey Completion Rate %.
- Company B shows 1201 Journey Completed out of 2119 Journey Hit, so it means that this has a **56.68%** number of Journey Completion Rate %

- Company C shows 1567 Journey Completed out of 3111 Journey Hit, so it means that this has a **50.37%** number of Journey Completion Rate %
- Company D shows 979 Journey Completed out of 2892 Journey Hit, so it means that this has a **33.85%** number of Journey Completion Rate %

Third metric we can use to evaluate the Chatbot is the Bot Accuracy based on Natural Language Processing and User Messages. According to Coniam (2014), the majority of the analyses and samples highlighted the chatbots' flaws, maybe overemphasizing the negative rather than the good elements of performance. Many of these topics were chosen, nevertheless, based on how ESL students may communicate with a chatbot and the kinds of input that a program would need to manage in order to attempt to reply to such input. Hence, NLP input is necessary to be added in the BOT to increase the level of understanding from the BOT towards the customer's utterances.

Bot Accuracy is simply acknowledging the user messages. If the message is not identified, it will be considered as inaccuracy in the NLP process. We are able to measure the Bot Accuracy by having this formula below:

- NLP A = [1 - (Unidentified user messages / Total User Messages)]*100

No	Company	Unidentified User Message	Total User Message	Bot Accuracy
1	A	432	899	48.05%
2	B	1923	2888	66.59%
3	C	1302	2121	61.39%
4	D	1789	3221	55.54%

Table 1.3. 4 Bot Accuracy for Existing FAQs Flow

- Company A shows 432 Unidentified User Messages out of 899 Total User Messages, so it means that this has a **48.05%** number of Bot Accuracy %.
- Company B shows 1923 Unidentified User Messages out of 2888 Total User Messages, so it means that this has a **66.59%** number of Bot Accuracy %.

- Company C shows 1302 Unidentified User Messages out of 2121 Total User Messages, so it means that this has a **61.39%** number of Bot Accuracy %.
- Company A shows 1789 Unidentified User Messages out of 3221 Total User Messages, so it means that this has a **55.54%** number of Bot Accuracy %.

1.2. Research Questions

1. How to improve Bot Accuracy score in the FAQs Journey using YAI Chatbot Cloud?
2. How to improve Journey Completion Rate in the Live Agent Journey using YAI Chatbot Cloud?
3. How to improve CSAT Score in the Ticketing Flow using YAI Chatbot Cloud?

1.3. Research Objectives

1. Creating an ideal model of Chatbot's flowchart of FAQs Journey in the YAI Chatbot Cloud Platform.
2. Providing the steps guidance flowchart of Live Agent Journey to achieve better Journey Completion Rate in the YAI Cloud Platform.
3. Providing the steps guidance flowchart of Ticketing Flow to achieve better Customer Satisfaction Score in the YAI Cloud Platform.

1.4. Scope of Problem

The scope of this research are:

1. This research shows the journey creation from given options under the PT YAI (platform service provider), in which this does not include the back end functional coding from the BOT platform.
2. This research does not encompass all free NLP libraries, in which this does include the given training set by the author.
3. The demo BOT will have restrictions in testing, in which this does follow the best practice and guides on how to test to run the BOT properly.

4. This Chatbot only exists in the Social Media of WhatsApp.
5. Last but not the least because of some charge limitation, the demo will not be lasting forever.
6. The Journeys will only be about FAQs, Live Agent and Live Ticketing flow.

1.5. Benefits of Research

This research aims to provide an example of system design on designing, installing, and improving the BOT in terms of non-conventional BOT in a Cloud Platform as a means of 4.0 advancement in an industrial and information technology world.

1.6. Systematic Writing

This master graduate thesis adheres the systematic writing in accordance with the format below:

CHAPTER I **INTRODUCTION**

This chapter contains a preliminary description of research activities, on the background of the problem, formulation of the problem, the objectives to be achieved, the benefits of research and systematic writing

CHAPTER II **LITERATURE REVIEW**

This chapter elaborated on the theories of reference books and journals as well as the results of previous research related to the research problem which is used as a reference for problem-solving.

CHAPTER III **RESEARCH METHODOLOGY**

Contains the description of the framework and lines of inquiry, the research object to be studied and the methods used in the study.

CHAPTER IV **COLLECTION AND PROCESSING DATA**

Contains the data obtained during the research and how to analyze them. Data processing results are displayed either in the form of tables and graphs. Data processing includes an analysis of the results. In this section is provided a reference for the discussion of the results to be written in Chapter V.

CHAPTER V **DISCUSSION**

It contains discussion on the results of data processing that have been conducted in research, compatibility with the objectives of research so as to produce a recommendation.

CHAPTER VI **CONCLUSIONS AND RECOMMENDATIONS**

Contains the conclusion of the analysis and any recommendations or suggestions based on the results that have been identified during the study.

REFERENCES

APPENDIX

CHAPTER II

LITERATURE REVIEW

2.1. State of the Art

State of the art from this research is attained in the technical processes, such as first, Dynamic Chatbot where it implements natural language processing with the procedural method. Secondly, 3 measurements namely Bot Accuracy, Journey Completion Rate, and customer satisfaction score. Thirdly, auto fetching chatbot and auto insert into the database for ticketing details for agent perusal. Last but not the least, the use of memory in the database for identifying the existing user.

2.2. Inductive Study

In the first research conducted by Nuria Haristiani (2019) with the title of "Artificial Intelligence (AI) Chatbot as Language Learning Medium: An Inquiry", it discussed about the common implementations of chatbot in current era within educational sector which resulted the 3 types of chatbot and layout the 6 advantages of utilizing chatbot under the perspective of students.

Category	Sub-Category	Function
Structure	Flow-Chatbot	A tree-based chatbot. Only answering what is inputted on the database. Flow contains buttons, keywords, and catchphrases (quick reply).
	AI	Users freely engage with updated learning capability.
	Hybrid	Combination between Flow and AI which impacts advanced human communication with structural patterns.
Purpose	Functionality	Containing certain limited function due to specific boundary (e.g., shop assistant, and reminder)

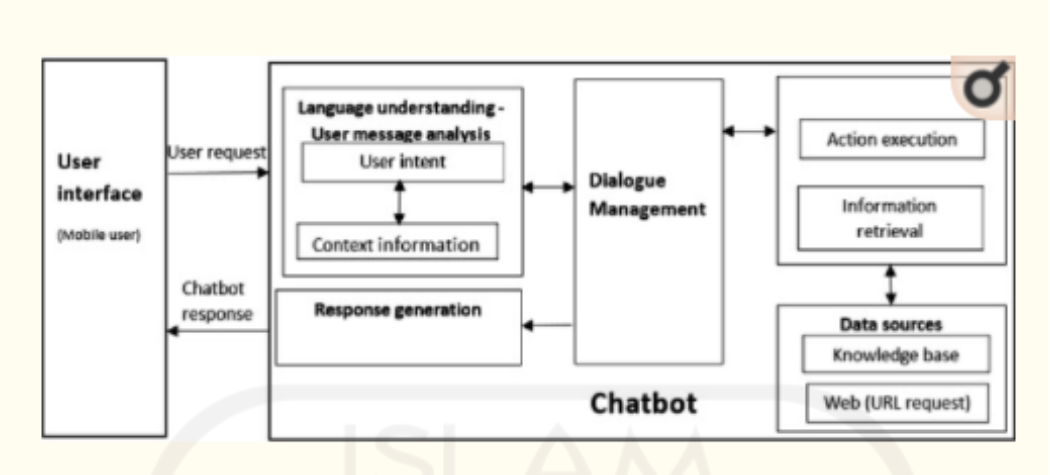
	Fun	Focusing on entertainment (e.g., games)
Audience	Generalist	Broad capacity of knowledge that can help us to solve common problems and sometimes specific one (e.g., Siri)
	Specialist	Focusing on one limited thing and perform outstanding (e.g., chatbot to serve customers online while ordering)

Table 2.1. Chatbot Category for the Usage

All categories of Chatbot mentioned by Author had encompassed 6 advantages for students to start the learning environment, such as:

1. Students tend to feel more comfortable to have conversations with BOT other than humans.
2. Flexibility of chatbots overpowers human endurance while serving the customer in terms of working hours.
3. Number of bots allows the standard to the extent of text and synthesized speech which lead students to exercise their listening and reading skills.
4. This is a symbol of advanced and global, students like its nuance as it brings freshness.
5. Students can explore new synonyms and unusual dictions.
6. Swift response and corrective action in terms of spelling and grammar.

Second research was conducted by Eleni Adamopoulou and Lefteris Moussiades in 2020 which discussed designing and developing a chatbot with a variety of techniques. Accuracy of knowledge representation, answer generation tactic, and a pack of relevant answers as a comeback when user copywriting is not understood are the fundamental requirements for designing a chatbot. What needs to be done in the early step in building a chatbot design is to create a division of constituent parts in accordance to a standard by modular developer approach. The design created by Adamopoulou and Lefteris Moussiades can be seen below.



Picture 2.1. Design of Chatbot Flow

User's request as a kick start of the journey which mostly forms text. This text will be a visual from the user to deliver to a chatbot. Once the chatbot receives the text, it will start to understand the language component that is parsed to a user's intention. The BOT will start measuring the utterance confidence level before acknowledging the proper intention, or say will it be a conflicted journey or not (depending on how complex the utterances training). Literature Review with comparisons between my research and other research to show:

No	Category	Discussion and Result	Added Value
1.	The Impact of Chatbots on Customer Service Performance	The advent of chatbots in customer service solutions received increasing attention by research and practice throughout the last years. However, the relevant dimensions and features for service quality and service performance for chatbots remain quite unclear. Therefore, this research develops and tests a conceptual model for customer service quality and customer service performance in the	

		context of chatbots. Additionally, the impact of the developed service dimensions on different customer relationship metrics is measured across different service channels (hotline versus chatbots). Findings of six independent studies indicate a strong main effect of the conceptualized service dimensions on customer satisfaction, service costs, intention to service reusage, word-of-mouth, and customer loyalty. However, different service dimensions are relevant for chatbots compared to a traditional service hotline	
2.	Increasing customer service efficiency through artificial intelligence chatbot	This study investigated the contribution of artificial intelligence (AI) to the efficiency of customer service. This study contributes to services technological innovation in process management, a field not yet settled in the literature. "The notorious AI cognitive maturity evolution allowed 181 million interactions and 7.6 million attendances in 2020, improving services efficiency,	In line with the evolutionary theory of innovation, the authors concluded that technological scaling in AI allows exponential gains in customer service efficiency and business process management. They also conclude that the strategy for creating AIUs is successful,

		with gains in agility, availability, accessibility, resoluteness, predictability and transshipment capacity. The chatbot service reduced the queues of call centers and relationship centers, allowing the human attendant to perform more complex attendances."	once it allows centralizing, structuring and coordinating AI projects in R&D cooperation, cognitive computing and analytics
3.	A New Chatbot for Customer Service on Social Media	Users are rapidly turning to social media to request and receive customer service; however, a majority of these requests were not addressed timely or even not addressed at all. To overcome the problem, we create a new conversational system to automatically generate responses for users requests on social media. Our system is integrated with state-of-the-art deep learning techniques and is trained by nearly 1M Twitter conversations between users and agents from over 60 brands. The evaluation reveals that over 40% of the requests are emotional, and the system is about as good as human agents in showing empathy to help users cope with emotional situations. Results also show our system outperforms	

		information retrieval system based on both human judgments and an automatic evaluation metric	
4.	The Impact of Chatbots on Customer Loyalty A Systematic	More and more companies have implemented chatbots on their websites to provide support to their visitors on a 24/7 basis. The new customer wants to spend less and less time and therefore expects to reach a company anytime and anywhere, regardless of time, location, and channel. This study provides insight into the influence of chatbots on customer loyalty. System quality, service quality, and information quality are crucial dimensions that a chatbot must meet to give a good customer experience. To make a chatbot more personal, companies can alter the language style. Human-like chatbots lead to greater satisfaction and trust among customers, leading to greater adoption of the chatbot. The results of this study showed that a connection between chatbots and customer loyalty is very likely. Besides, some customers suffer from the privacy	

		paradox because of personalization. Implications of this study are discussed.	
5.	Estimating the Impact of Humanizing CS Chatbots	We study the impacts of 'humanizing' AI-enabled autonomous customer service agents (chatbots). Implementing a field experiment in collaboration with a dual channel clothing retailer based in the United States, we automate a used clothing buy-back process, such that individuals engage with the retailer's autonomous chatbot to describe the used clothes they wish to sell, obtain a cash offer, and (if they accept the offer) print a shipping label to finalize the transaction. We causally estimate the impact of chatbot anthropomorphism on transaction conversion by randomly exposing consumers to exogenously varied levels of chatbot anthropomorphism, operationalized by incorporating a random draw from a set of three anthropomorphic features: humor, communication delays and social presence. We provide evidence that, in this retail	

		setting, anthropomorphism is beneficial for transaction outcomes, but that it also leads to significant increases in offer elasticity. We argue that the latter effect occurs because, as a chatbot becomes more human-like, consumers shift to a fairness evaluation or negotiating mindset. We also provide descriptive evidence suggesting that the benefits of anthropomorphism for transaction conversion may derive, at least in part, from consumers' increased willingness to disclose personal information necessary to complete the transaction.	
6.	Speech Sentiment and Customer Satisfaction Estimation	For an interactive agent, such as task-oriented spoken dialog systems or chatbots, measuring and adapting to Customer Satisfaction (CSAT) is critical in order to understand user perception of an agent's behavior and increase user engagement and retention. However, an agent often relies on explicit customer feedback for measuring CSAT. Such explicit feedback may result	

		in potential distraction to users and it can be challenging to capture continuously changing user's satisfaction. To address this challenge, we present a new approach to automatically estimate CSAT using acoustic and lexical information in the Alexa Prize Socialbot data. We first explore the relationship between CSAT and sentiment scores at both the utterance and conversation level. We then investigate static and temporal modeling methods that use estimated sentiment scores as a mid level representation. The results show that the sentiment scores, particularly valence and satisfaction, are correlated with CSAT. We also demonstrate that our proposed temporal modeling approach for estimating CSAT achieves competitive performance, relative to static baselines as well as human performance. This work provides insights into open domain social conversations between real users and socialbots, and the use of both acoustic and lexical	

		information for understanding the relationship between CSAT and sentiment scores.	
7.	Chatbot Arabic	Chatbots have been widely used in many spheres of life from customer services to mental health companions. Despite the breakthroughs in achieving human-like conversations, Arabic language chatbots driven by AI and NLP are relatively scarce due to the complex nature of the Arabic language. Objective: We aim to review published literature on Arabic chatbots to gain insight into the technologies used highlighting the gap in this emerging field. Methods: To identify relevant studies, we searched eight bibliographic databases and conducted backward and forward reference checking. Two reviewers independently performed study selection and data extraction. The extracted data was synthesized using a narrative approach.	

Table 2.2. Comparison Study in the Chatbot Environment

2.2. Deductive Study

2.2.1. Chatbot System Design Flow

Chatbots demonstrate speech non verbal taken from the conversations with the human end-user. A chatbot grasps language to communicate with humans, supported by natural language processing (NLP) and machine learning (ML), both correlated to the discipline of AI.

This advanced chatbot was first established around the 1960s to ensure users felt like they were feeling like chatting with a real human. Several chatbots display backgrounds with more human-like traits. To connect with the conversation, the BOT fetches a large database of response categories.

Systems Design Engineering is all about how to create and integrate knowledge across a variety of studies. It is applied from systems thinking, modeling and analysis that we copy to depict the expected environment. In tackling the issues of engineering problems, they often require the model of improvement, engineering or model of systems.

System design engineering methods are customarily demanded with the innovation, deep research, and model or design of ideas for fresher items. It is also responsible for the engineering output or development of products or processes that are already in existence. It is meant that a company's products are modeled to enhance the user experience and satisfaction level for stakeholders.

The common media used by system engineers is flow diagram platform. Here system engineers are able to visualize the flow on how the process end to end that later will be submitted to developers to make the project happen. System engineers are the one who can bridge between client’s project and developers. By this capacity, system engineers are likely to have solid communication skills in terms of management and technical or even product knowledge. This language-skill is usually helped by the flow presented and made by system engineers only in which they usually conduct it by many platforms, for example Diagram.io.

2.2.2. Root Cause Analysis

One of the skills required by this chatbot design and implementation is critical thinking to generate applicable and effective solutions. Upon the given project from vary and boundless imaginations, at the initial phase or so called requirement gathering process, system engineers are requested to be able to imagine the effective scenarios and to put into feasible actions to solve the client's query. Aside from the experience that matters, this ability is earned by the wild and explorative thinking that becomes the mandatory skills for them.

In research from Brandtzaeg and Følstad (2017), the use of chatbots may usher in a new paradigm for how users engage with data and services in the future. There are currently few scientific studies regarding why individuals utilize chatbots. This study offers much-needed understanding of the driving forces behind the use of conversational interfaces. Its findings can direct future research on the subject, which may yield fresh insights and direct chatbot design and development in the future.

Critical thinking is meant to generate fresh ideas on how to solve the problems. Keys on solving the problem are divided into two phases in which firstly is to identify the case and its root causes and secondly is to determine the best practice to overcome what has to be a matter.

2.2.3. Machine Learning

To improve the role of NLP in the bot, Machine Learning plays its role by providing techniques that are often implemented inside of NLP. Machine learning can be depicted as a computer program that learns to understand and to mimic the given response training for the computer to be able to give feedback as expected by the trainer.

According to Coniam (2014), the majority of the analyses and samples highlighted the chatbots' flaws, maybe overemphasizing the negative rather than the good elements of performance. Many of these topics were chosen, nevertheless, based on how ESL students may communicate with a chatbot and the kinds of input that a program would need to manage in order to attempt to reply to such input. Hence, NLP

input is necessary to be added and be processed with the help of machine learning in the BOT to increase the level of understanding from the BOT towards the customer's utterances.

2.2.4 Natural Language Processing

Natural language processing (NLP) presents several specific events or phenomena in the form of a phrase technique. It is commonly used for recognition and response analysis to acknowledge a complex correlation of causes for certain problems or events.

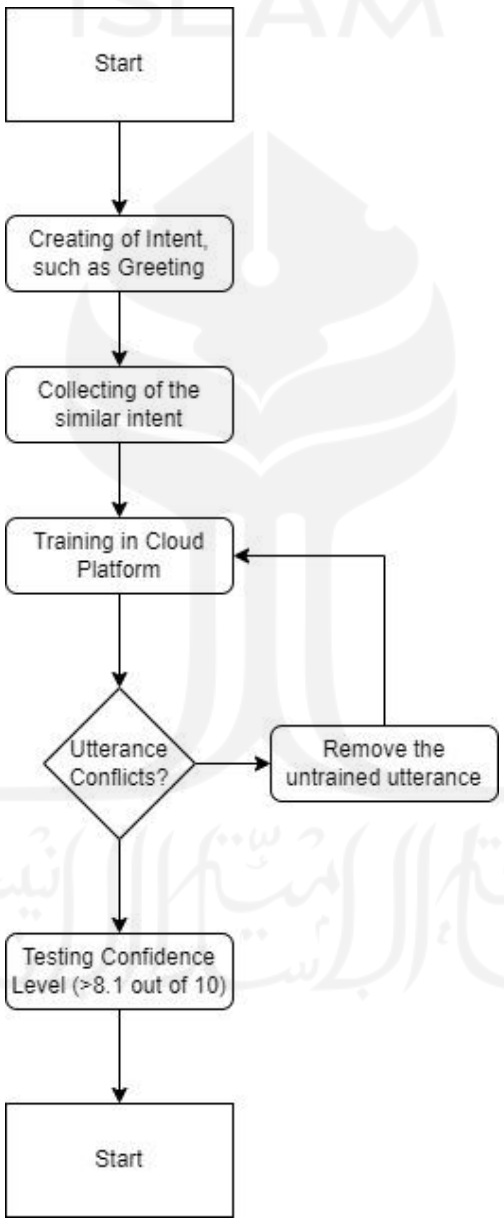
In research from Suta et al (2020), a chatbot is a genius framework which can sustain a discussion with a human utilizing common dialect in seamless time. Due to the rise of Web utilization, numerous businesses currently use online stages to take care of the client requests, and numerous of them turn to the chatbots for making strides in their customer service or for streamlining operations and expanding their productivity. Be that as it may, there's still a hole between existing chatbots and the independent, conversational operators businesses trust to actualize. As such, this paper will begin with an overview of chatbots and after that center on investigating patterns with respect to the advancement of human-like chatbots competent in closing this mechanical crevice. We looked into the writing distributed over the past decade, from 1998 to 2018, and displayed a diagram of chatbots employing a mind-map.

Natural language processing, known as NLP, is a field of artificial intelligence where computers are designed to be able to interact with humans using natural language. NLP does not aim to transform the language received in the form of text or voice into digital data and/or vice versa; rather, it aims to understand the meaning of the sentences given in natural language and provide appropriate responses, for example by performing a certain action or displaying certain data.

Chatbot with Natural Language Processing (NLP) is proven useful in many ways, including English learning. According to Aprilinda et al., (2022), NLP implementation in chatbot has been useful to help students learn English grammar as an alternative in independent learning. Students are able to find out the knowledge related to the

grammar of tenses that they are curious about by simply typing with the BOT with NLP implementation in it.

Conversation from BOT to humans throughout the media is using NLP. NLP is included under the discipline of computer science that highlights computational techniques. The aim from these computational techniques for BOT is to learn, to comprehend, and to create human language categorial.



Picture 2.2 Steps of Implementing NLP in Cloud Platform

2.2.5. Chatbot Flow / Chatbot Journey (Chatbot Flow in Cloud Platform)

Chatbot enablement in the Cloud that has been provided by Software Service Company is far different from other conventional Chatbot enablement, such as development using some language functions from scratch. This enablement contains its set of functions and rules from its backend. Developer will need to do these following steps to achieve its goal in enabling BOT in the Cloud, the steps are as follows:

- Creating the use case of the Chatbot in the flowchart design.
- Creating the Journey and Intent for its target result from utterance's training in Sandbox environment.
- Setting the procedural flow per journey and connecting one Journey to another.
- Training the intent with Natural Language Processing.
- Proceeding the Standard Integration Testing to check the use cases and validators in the Staging environment.
- Attaching the WhatsApp Business API Number to the Cloud.
- Release the Chatbot to the Production environment.

Chatbot use case is the design or flow that we expect where our BOT will take or have communication or direct the end user to. This use case will become a guidance for developers to create the Chatbot. In a use case, it should contain technical and feasible steps that explain where BOT should go from a certain point to the next route. This flow should also cover the precise connecting dot that shows clear choice for the user to communicate with the bot. On the other hand, there should be a user-friendly aspect in the flow (use case) to make users convenient and understand how to communicate with the BOT design that we have in order to satisfy the goal from the use case in our Chatbot.

In research from Oguntosin and Olomo (2021), the goal of the chatbot is to converse with the pupils in real time while being knowledgeable and accurate. Users can do this by chatting with the BOT to get information about specific things they want

to buy and making payments online before they go to the mall (if the case is in the commerce industry).

According to Johari & Nohuddin (2021), good quality chatbot should cover functionality, reliability, usability, efficiency, maintainability, and portability. The most important part from these variables is that functionality. It means the capability from the software to present task-solving services to the customers, so that it meets their requirements and situations.

According to Han (2020), chatbot design flow should follow the behavior from the customers in order to elicit high-quality feedback without breaking any morals rules. The result from observing customers' behavior will impact these two things, namely eliciting the designs and improving the chatbot framework. In addition Han (2022) added that by revealing the question of *Why would participants digress when interacting with interview chatbots? What would participants unexpectedly reveal their sensitive information when interacting with interview chatbots?* will give us the better insight of which impact variables support a chatbot elicitation's ability and how to adapt our framework to different people.

In research from Illescas-Manzano et al (2021), the use of an integrated commerce chatbot can help in achieving these goals, as well as the following additional advantages: It was simpler to measure lead generation. This is a valuable tool for determining how useful a chatbot is to users so that we can see in real time how it influences any actions or flows that are subsequently added to the chatbot. Due to the quick transfer of this data to the CRM, it enables more data entry of potential consumers into the system, both in terms of data volume and quality. This is significant because the communication is instant. As a result, the user's relationship with the business starts the moment he expresses interest in what it has to offer.

According to Candello, Vasconcelo, & Pinhanez (2017), new conversation metrics that may have an impact on the user experience with multi-bot systems should be taken into consideration by researchers and chatbot designers. The examples are these points below:

1. How frequently and how often users use the scroll bar. We saw individuals skimming the text to better understand their surroundings.
2. To forecast what words users would input next and to increase the corpus defining those terms, find words that users have already seen in the same chat.
3. Count the instances in which comparison was used in the same discourse to evaluate well-informed choices.

2.2.6 Intent (User Expression for Bot Accuracy)

Chatbot has a number of challenges and one of them is allowing the user to ask queries in free format / diverse dialects. In this way, developers as well as the NLP trainer require to add the library of intents and to adjust them into the more suited categories. Hence the Chatbot is able to properly collaborate (Ahmed et al., 2022).

In research from N et al. (2021), a contextualized chatbot can be created by integrating intent categorization with models. These chatbots can be utilized in a variety of organizations. These kinds of chatbots will be very profitable for customer service firms, and the most crucial aspect of these models is that the more precise the intent classification and chatbot are, the greater the dataset is.

One of the most important challenges faced by chatbot developers is allowing the user to feel as though they are speaking to a real person. Applying an Artificial Intelligence (AI) algorithm has allowed a breakthrough in achieving human-like responses. AI algorithms require the processing of large amounts of data and interactions. Such data has been somewhat achieved with AI-powered conversational agents such as Facebook messenger bots, Alexa, Microsoft Cortana, and Siri. These datasets and other openly available corpora remain largely in the English language. This means that even those who have a good grasp of the algorithms often lack the data to develop and further optimize Arabic language chatbots. A previous study looked into the freely available Arabic corpora and found only 66 sources. However, not all of these would be useful for building AI-based chatbots. Another challenge of developing

Arabic language chatbots is that the Arabic language has rich morphology, orthographic variations, ambiguity, and multiple dialects.

2.2.7 Customer Satisfaction Score (CSAT)

According to Kim, Levy, & Liu (2020), customer Satisfaction Score (CSAT) is one of the valid measurements for the Chatbot. It functions to capture the satisfaction level from the end-users towards the performance from the chatbot logic. As we know in the chatbot logic, it may contain both dynamic natural language processing or not and a good category of the logic.

CSAT is commonly put in the BOT level as well as agent level. The looks of the BOT level generally raise a question whether the customer is happy with the bot's answer or vice versa. However in the agent level it may include 2 levels which are firstly about if the query is solved and the voluntary rating for the related agents. This CSAT now is used in every BOT industry for measuring its performance in the world of Customer Service / Customer Experience.

CHAPTER III

RESEARCH METHODOLOGY

3.1. Research Objectives

The researcher focuses on elevating the Customer Satisfaction Score, Journey Completion Rate, and BOT Accuracy by implementing 3 unique approaches or journeys' proposals by using the third party platform. This research will be conducted via Cloud App and its internal database, as well as NodeJS as the domain tool and language programming to create a demo BOT.

3.2. Literature Review

A literature review is categorized into 2 parts in this research which are deductive and inductive study.The deductive study is the part where it explains the fundamental theory regarding the research topic. It aims to bestow the basic comprehension for the readers about this research. Meanwhile, the inductive study is the procedure literature which is arranged properly, thus it will bestow the advanced knowledge to readers and show the distinctive differences between this research and another.

3.3. Data Collection

This research applies for primer data in conducting the research. Primer data is any form of a record or written scientific research that is taken by direct measurement or an instrument, so that later it will be able to represent the condition of the focused area. Collected data in this research is from the selected company, namely PT YAI (manipulative alias name). It creates the BOT for companies which are mostly commerce based. In addition, this research also includes several kinds of literature in order to support the validity and method used, thus it is hoped that the outcome will be greatly as good as expected.

3.4. Data Processing

Data processing is the representation of the process work on how the BOT should look like from the available alternatives. Several tools used in this research are Cloud App, Internal Database from Cloud, Draw I.O, and NodeJS.

The implementation was applied to an illustrative case-study based on hypothetical sabotage to a storage tank in process facility which leads to major bugs. The objective of this study is to prove whether or not the application of cost-benefit analysis provides economic aid or criterion for selecting additional security measures in the process plant. According to the study result, it is proven that cost-benefit analysis may offer relevant support in security risk analysis and its related decision-making process in the chemical and process industry domain.

3.5. Discussion

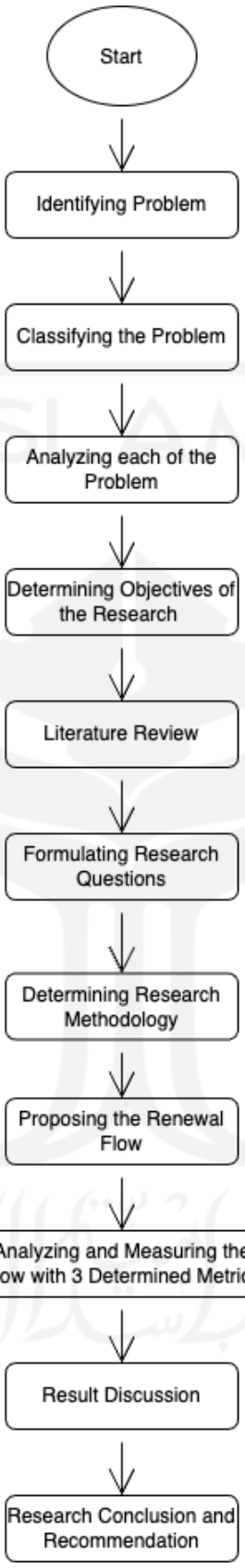
The author will conduct a system design project with true application, then we will show the demo in the final show. The process will begin from a given existing flow from one of real examples, collecting the missing requirement, fixing the flow with best practice and creating the BOT.

3.6. Conclusion and Recommendation

The conclusion will be about answering the proposed questions in the problem formulation part, in Chapter I. This part will also give a few recommendations that may be used to improve or to elevate further research.

3.7. Research Flowchart

This research flowchart is to show how this research is conducted. These steps are important to display, because it portrays the concept of how the author moves from the beginning until the conclusion of the research, so that the readers may easily understand. 3.1 below:



Picture 3.1. Research Flowchart

CHAPTER IV

DATA COLLECTION AND PROCESSING

4.1. Data Collection

This research collects data from the company which provides types of conversational AI, especially Chatbots. This company applies the system Software as a Service to make the Chatbots. It has secured several big brands in their business by providing them self and assisted service in creating the Chatbots. One of the examples from the Chatbots will be replicated and shown in this research for showing and implementing the design, installation, as well as improvement from the conventional Chatbots. The methodology used encompasses creation of advanced information technology engineering flowchart, installation of the Chatbots to PT YAI Platform from the flow design, and launching the Chatbots as the demo in one of the social media applications.

4.1.1. PT YAI Profile

PT YAI is headquartered in the United States of America. This company provides software development services, especially BOT in the cloud. This company was founded and established in 2019 and still actively grows until the present day.

PT YAI is the producer of the BOT with varied functions. The types of business service start from government, logistics, culinary, medical and even any client-customer business sector.

The process of the division work includes Platform, Product, Delivery, Pre-sales, as well as Adoption team. The team in charge of making the BOT for clients is the delivery team. The sequence of jobs in the Delivery team includes, requirement gathering, finalizing requirement, Development, Standard Internal Testing (SIT), User Acceptance Testing (UAT), and Go Live. In this research we will run through the process mostly in the development and SIT.

4.1.2. Data Existing

The metric of CSAT from these following companies are as follows:

- Company A shows 195 Not Satisfied out of 337 tickets, so it means that this has **57.86%** number of Not Satisfied customers.
- Company B shows 152 Not Satisfied out of 210 tickets, so it means that this has **72.38%** number of Not Satisfied customers.
- Company C shows 363 Not Satisfied out of 653 tickets, so it means that this has **55.59%** number of Not Satisfied customers.
- Company D shows 218 Not Satisfied out of 488 tickets, so it means that this has **44.67%** number of Not Satisfied customers.

Second metric we can use to evaluate the Chatbot is the Journey flow completion rate. Journey flow is the flow that developers design to make the customers easily understand and communicate to the Chatbot in accordance to the customers' behavior, ideally. We are able to measure the effective of the design by checking the Journey Completion Rate %, and the formula to calculate it is:

Journey Completion Rate % = Journey Completed by User / Total Journey Hit

Below is the data for the 4 months length for 4 companies:

No	Company	Journey Completed	Journey Hit	Journey Completion Rate
1	A	780	1975	39.49%
2	B	1201	2119	56.68%
3	C	1567	3111	50.37%
4	D	979	2892	33.85%

Table 4.1. Existing CSAT Result with the Existing Ticketing Bot Flow

- Company A shows 780 Journey Completed out of 1975 Journey Hit, so it means that this has a **39.49%** number of Journey Completion Rate %.

- Company B shows 1201 Journey Completed out of 2119 Journey Hit, so it means that this has a **56.68%** number of Journey Completion Rate %
- Company C shows 1567 Journey Completed out of 3111 Journey Hit, so it means that this has a **50.37%** number of Journey Completion Rate %
- Company D shows 979 Journey Completed out of 2892 Journey Hit, so it means that this has a **33.85%** number of Journey Completion Rate %

Third metric we can use to evaluate the Chatbot is the BOT accuracy based on Natural Language Processing and User Messages. Bot Accuracy is simply acknowledging the user's messages. If the message is not identified, it will be considered as inaccuracy in the NLP process. We are able to measure the Bot Accuracy by having this formula below:

- NLP A = [1 - (Unidentified user messages / Total User Messages)]*100

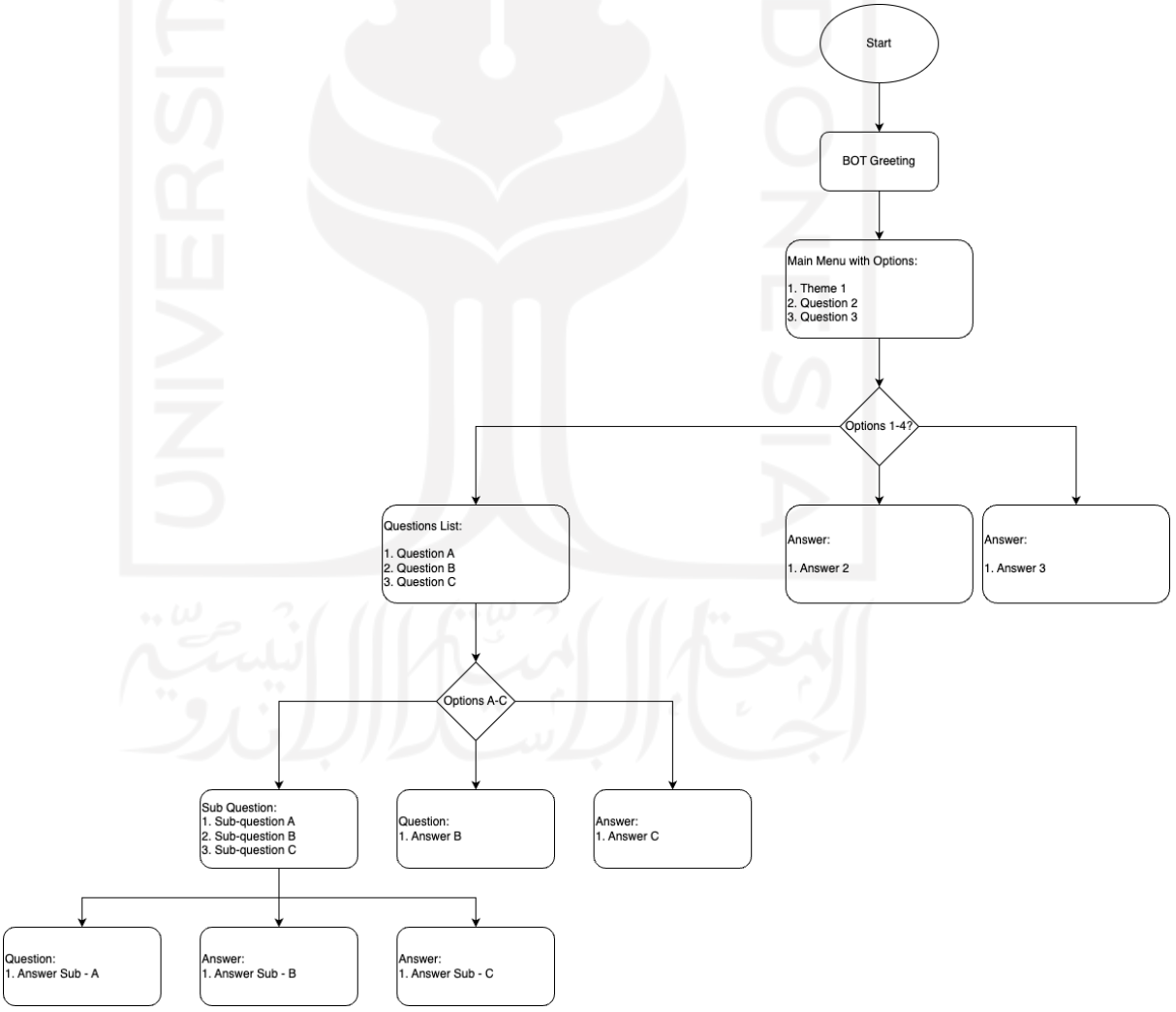
No	Company	Unidentified User Message	Total User Message	Bot Accuracy
1	A	432	899	48.05%
2	B	1923	2888	66.59%
3	C	1302	2121	61.39%
4	D	1789	3221	55.54%

Table 4.2. Existing Bot Accuracy in the FAQs Bot Flow

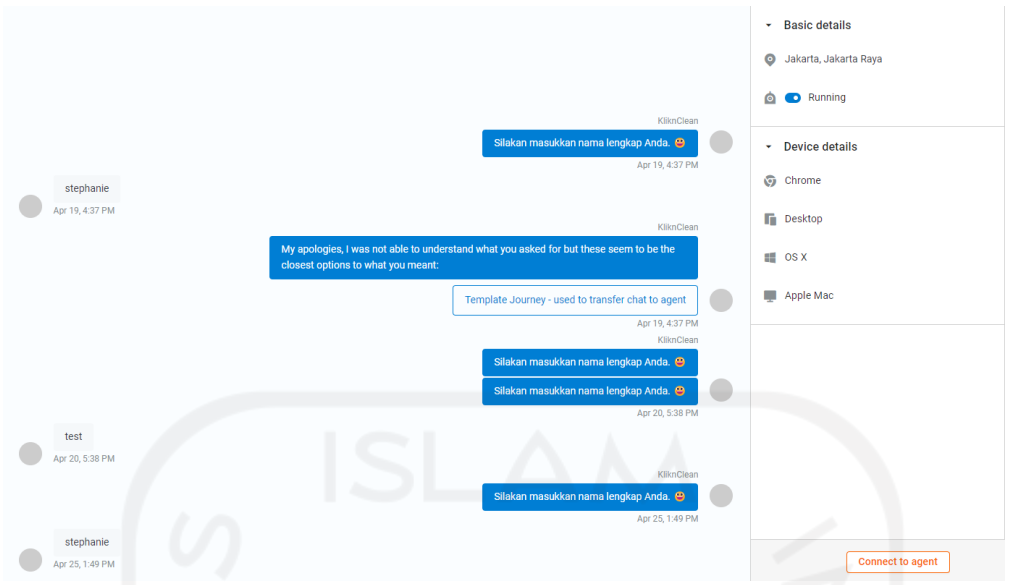
- Company A shows 432 Unidentified User Messages out of 899 Total User Messages, so it means that this has a **48.05%** number of Bot Accuracy %.
- Company B shows 1923 Unidentified User Messages out of 2888 Total User Messages, so it means that this has a **66.59%** number of Bot Accuracy %.
- Company C shows 1302 Unidentified User Messages out of 2121 Total User Messages, so it means that this has a **61.39%** number of Bot Accuracy %.
- Company A shows 1789 Unidentified User Messages out of 3221 Total User Messages, so it means that this has a **55.54%** number of Bot Accuracy %.

4.1.3. Bot Accuracy in the Existing FAQs Bot Flow

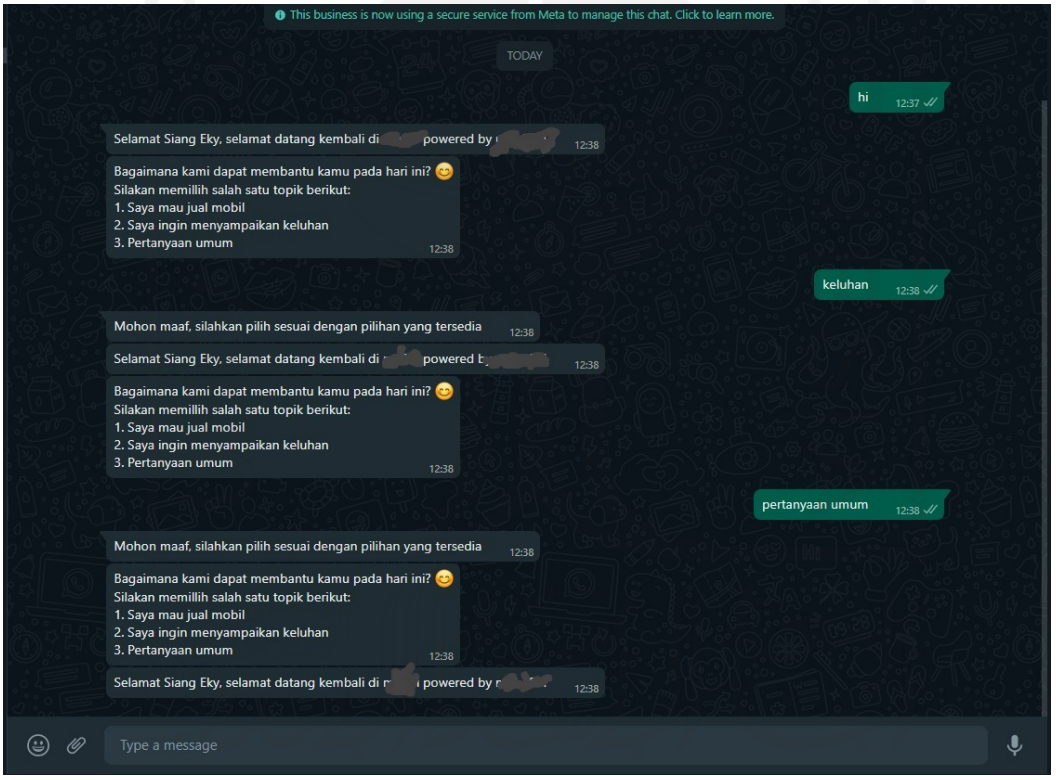
Frequent Ask Questions (FAQs) are commonly developed in 2 forms, either it is requested by the clients or following the best practice from the Business Analyst person. FAQs become one of the most favorite subjects in BOT development because it helps the monotonous duty from the agent. The agents do not necessarily have to reach out or to reply to the ticket from the customers as the wished answer is able to be visualized by the BOT. The analytics from the journey from the FAQs development also show the management level how effective this replacement duty is from the agent to actually replace the agent.



Picture 4.1. Existing FAQs Flow (Uncategorized FAQs)

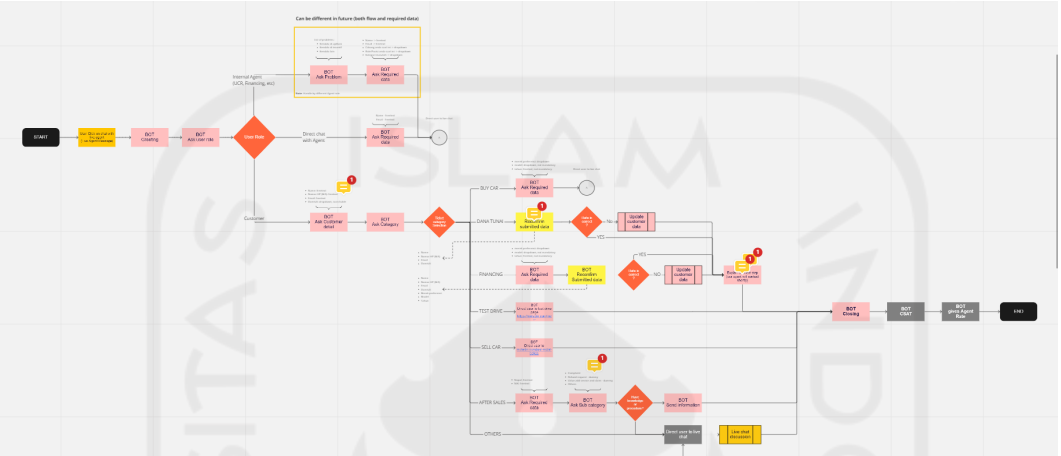


Picture 4.2. Sample BOT without NLP (Unable to Capture Dynamic Intent)



Picture 4.3. Sample Procedural Chatbot (without NLP)

The analytics for this flow can be **Journey Completion Rate** as well as **Bot Accuracy**. This journey has a potential to churn customers much because of the length of the process, uncategorical and random message from the BOT towards the demanded customer's answer. This is a best practice for the FAQs BOT flow for most of the clients.



Picture 4.4. Existing FAQs Flow (Provided by the Client)

According to Vu et al. (2021), a growing number of firms are beginning to take use of chatbots' and conversational systems' capacity to conduct routine communication duties. Business companies can easily and quickly create their own systems using the wide range of chat-bot development frameworks offered by tech giants. These frameworks frequently fall short of providing a complete set of capabilities necessary to create a manageable, flexible, and scalable chatbot. As a result, it is frequently necessary to integrate more machine learning methods in order to improve performance. In this research, we present a chatbot system that responds to frequently asked questions (FAQs) from our school website using machine learning. To handle lengthy and sophisticated user inquiries, the system has a vector similarity analysis component as well as different user query types. Hence, this shows that FAQs is one of the targeted methods to loosen up the loads in the world of Customer Service and Customer Experience.

Bot accuracy is owned when there is registered bunch of utterances within the **intent start** and **synonyms** within the **condition** as well as **trains module** the. The

intent-starts function the initial trigger for the BOT to recognize what response shall be given when the customer types certain sentences/keywords. Meanwhile, **synonyms** work for assistance for the intent-start to enrich the vocabulary for the BOT to know what customer may type. The formulated with below formula:

- NLP A = [1 - (Unidentified user messages / Total User Messages)]*100

4.1.4. Customer Satisfaction Score in the Existing Ticketing Bot Flow

Customer Satisfaction Score (CSAT) is a feedback range developed to measure the satisfaction level from the customer towards the service given the procedure of the BOT as well as the agent's response. These two activities can be adjusted from the BOT level, such as the BOT asks for name, email, and other personal information data before the customer is connected to the agent.

In research from Setiawan et al. (2020), well programmed chatbot and integration to segmented channels, like Telegram, can assist customer complaints and be useful in the customer service department which will lead into customer's satisfaction. In this research, it also suggests where this will be more helpful for the chatbot if the chatbot can be designed in the dynamic way where it can be connected with an internal company database.

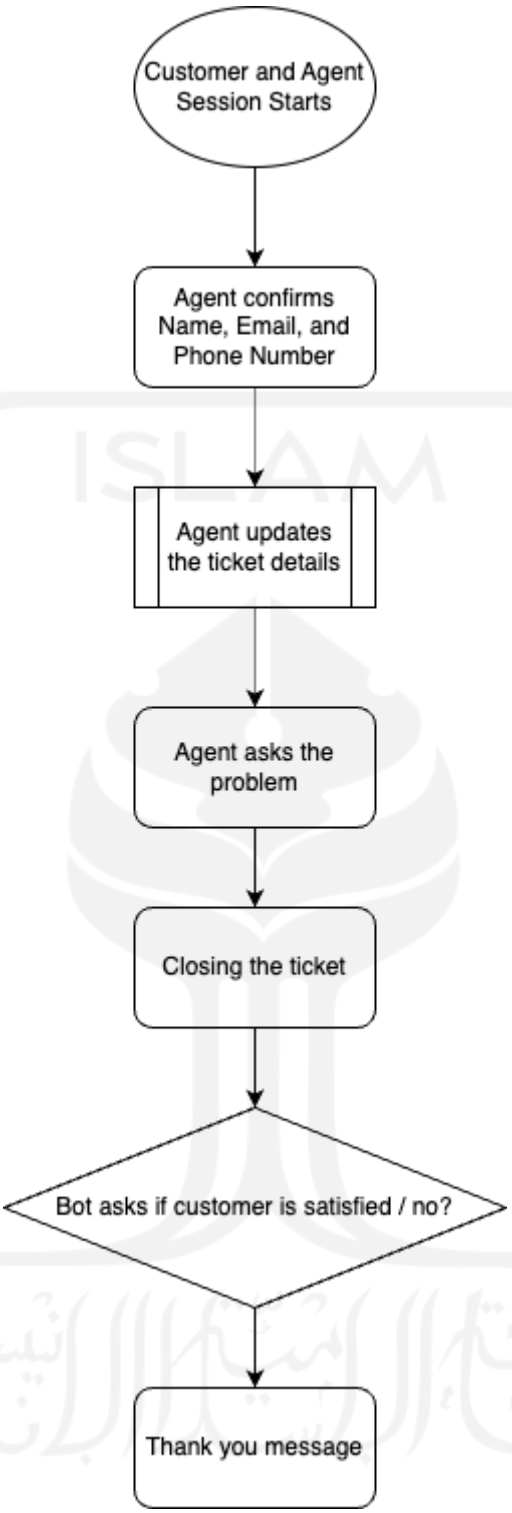
In research from Xu et al (2022), one of the drives to customer satisfaction from chatbots is by using a social-oriented communication style. It means that any phrases or utterances that are, not only familiar, rather to be close with the users and easy for them to engage with. One of human characteristics is that they will tend to open up with something close or similar to them.

In research from Chung et al (2020), artificial intelligence may now supply marketing efforts through e-service agents, which has an impact on how well customers perceive brands and the quality of their communications. Chatbot demonstrates that views of having received quality communication are necessary for consumer satisfaction with luxury retail brand e-service agents. It also demonstrates how

e-service workers may not always fully communicate with clients, but that digital service assistance technologies can nonetheless contribute to the development of excellent customer connections. The findings of our study can serve as a benchmark for fashion firms to make sure that their e-service marketing campaigns are effective. Exclusive experiences are expected by luxury clientele. Digital settings can improve company-customer connections, consumer satisfaction, and purchasing experiences even while offline brand performance is still crucial. Fashion firms are recommended to supply accurate and trustworthy information to boost online communications and ensure successful marketing initiatives.

According to Handoyo et al. (2018), to process a single request, such as ordering goods, booking a ticket, or obtaining services, a personal assistant using a human operator needs some time. For some online information, one request can include numerous questions. Time efficiency is valued in business success, hence there should be another means to handle requests. A chatbot may provide 24 hour support, which is advantageous compared to hiring a human personal assistant. This shows that Ticketing Bot Flow is a required and pivotal aspect to be evaluated in order to help to achieve the customers' query which will lead into a satisfaction score.

According to Kim, Levy, & Liu (2020), CSAT is a valid measurement for Chatbot. The implementation from the CSAT can improve the effectiveness from the agent work by evaluating the performance metrics given. In its current best practice implementation, CSAT not only can help to improve, but also contradicts with its satisfaction of the customers, such as BOT asks name, email and other personal information data before connecting with the customer. This process annoys the customer. The flow for the existing Live Agent is below:



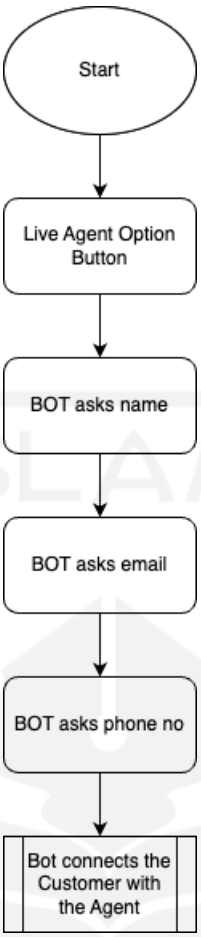
Picture 4.5. Existing Ticketing Flow (Post Uncategorized Flow)

The CSAT from implementing the existing flow taken from these following companies result the score as follows:

- Company A shows 195 Not Satisfied out of 337 tickets, so it means that this has **57.86%** number of Not Satisfied customers.
- Company B shows 152 Not Satisfied out of 210 tickets, so it means that this has **72.38%** number of Not Satisfied customers.
- Company C shows 363 Not Satisfied out of 653 tickets, so it means that this has **55.59%** number of Not Satisfied customers.
- Company D shows 218 Not Satisfied out of 488 tickets, so it means that this has **44.67%** number of Not Satisfied customers.

4.1.5. Journey Completion Rate in the Existing Live Agent Bot Flow

Live agent journey is the most used journey in the CS/CX industry. Chatbot is an assistance for the agent to make the work from the agent easier and avoid static or repetitive work. Most customers, depending on the business and urgency, prefer to connect directly with the agent when firstly talking to the BOT and some do not.



Picture 4.6. Existing Live Agent Flow (Without Memory and Auto Fetch Sender ID)

In research from Aleedy et al. (2019), one of the most crucial communication channels used by businesses to offer clients before- and after-sale services is customer support. This includes corresponding over telephones, computers, and social media sites like Twitter. With the aid of modern technologies, the connection becomes considerably quicker and simpler. Companies utilize virtual agents (Chatbots) in the customer service industry to assist customers via desktop interfaces. The primary goal of this research is to create automatic "Chat" conversations between a computer and a human. To do this, an interactive artificial intelligence agent will be developed using deep learning and natural language processing to predict the most appropriate and automatic responses to customer inquiries.

According to Pereira (2019), chatbots, also known as conversational agents, are software systems that can interact with people through natural language, text, or voice interfaces. It has grown in popularity mainly due to recent advances in AI, and this paper presents a state-of-the-art analysis of this technology. Each architecture has its limitations, but you can develop chatbots very quickly using one platform. With the help of Link Consulting, we were able to design, prototype and develop a customer support chatbot with ticketing functionality for the Portuguese Railway Company (CP). Machines still have a long way to go to truly understand natural language. This shows that Live Agent is easy to implement and useful for chatbot, yet requires a strategy for its effective use.

In research from Memon et al (2018), multi-agent communication systems with chatbots require natural language processing and utterances in each of its journeys for it being able to be responsive towards the input given. This could be samples from end users' typical words or any collected similar utterances. Post utterances installation to each of journeys in the chatbot, chatbot will be able to recognize the input and process what action to be done.

Journey completion rate is a metric to visualize the customer's trace during chatting with the chatbot. With the current implementation of Live Agent flow, we have seen the result that they are not well performed. The percentage result as well as the formula to calculate Journey Completion Rate can be checked below:

Journey Completion Rate % = Journey Completed by User / Total Journey Hit

- Company A shows 780 Journey Completed out of 1975 Journey Hit, so it means that this has a **39.49%** number of Journey Completion Rate %.
- Company B shows 1201 Journey Completed out of 2119 Journey Hit, so it means that this has a **56.68%** number of Journey Completion Rate %
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CHAPTER 5

DISCUSSION

5.1. The Result of Improving FAQs flow for Bot Accuracy

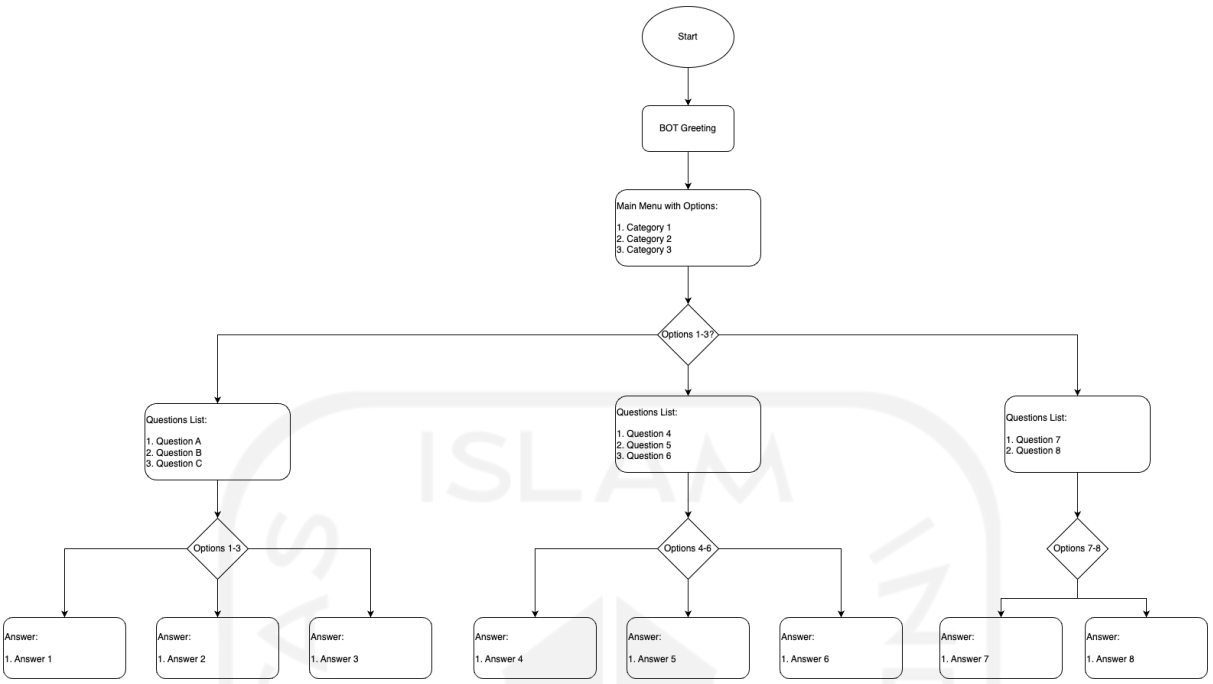
As we know that frequent most asked questions (FAQs) that we found are developed with 2 forms, either it is procedural without utterances added to the each of step and uncategorical. We have come to know by these problems that utterances and providing proper category within the faqs will help to improve the quality for Bot Accuracy in the chatbot.

In research from Nobre et al. (2019), chatbot's capability is to the extent capable of delivering the FAQs correctly and efficiently, and also able to help the users to spot the relevant information swiftly without necessarily feel the need to get in touch with administrative human officer to get the answer from their questions.

Bot accuracy requires many utterances to be trained within the bot, so that the BOT could catch the keyword or intent from the customer when the customer types a variety of wordings. As we know, lack of utterances will cause the chatbot to not be able to respond back to the customers.

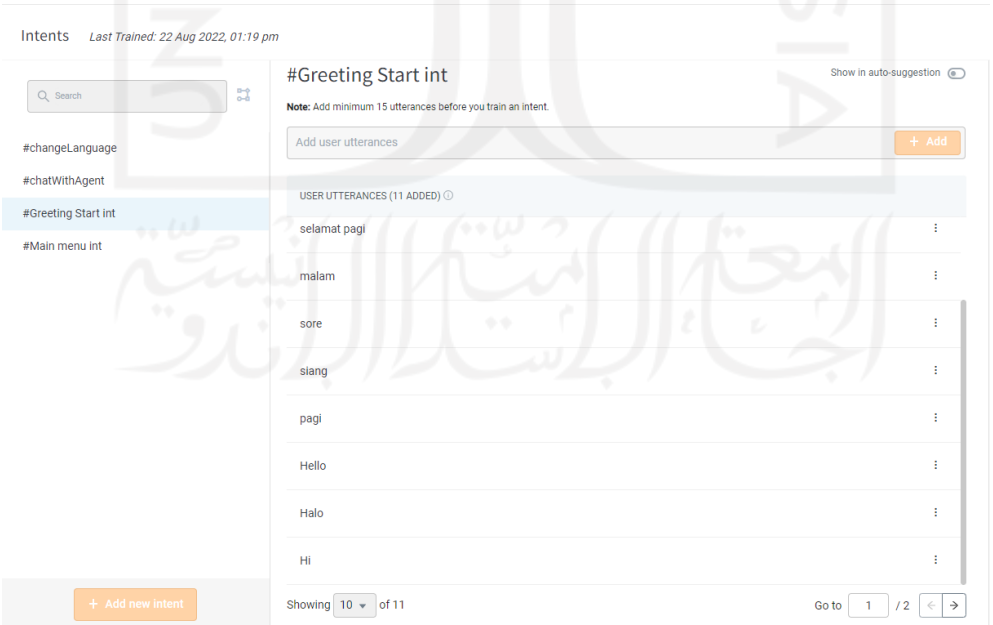
As the categorical chatbot within FAQs journey will help to segment or limit the probability of random typing from the customers. When people see 3 big categories of the FAQs, they will tend to form the question based on the provided question instead of phrasing their own words and deliver it to the bot. Hence, this categorical FAQs journey will help Bot Accuracy.

To measure our new flow as well as new best practice upon improving Bot Accuracy for the company, we take again the 4 alike-business companies (Commerce-B2C) to implement our FAQs format and check for its Bot Accuracy result with the given NLP formula. How Bot Accuracy works is that it simply determines whether the BOT acknowledges the user messages or vice versa . If the message is not identified, it will be considered as inaccuracy in the NLP process.

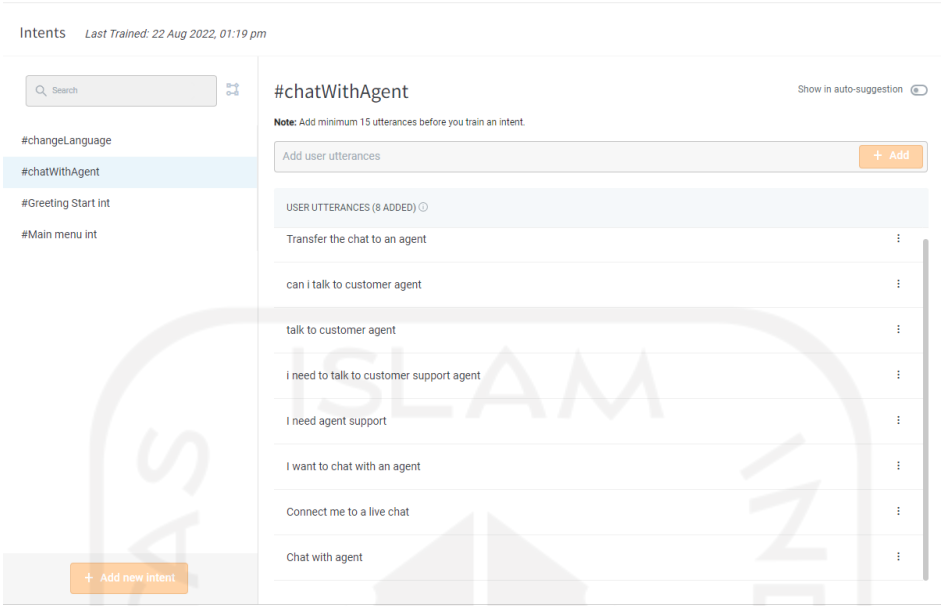


Picture 5.1. Proposal of FAQs Flow (Categorized FAQs)

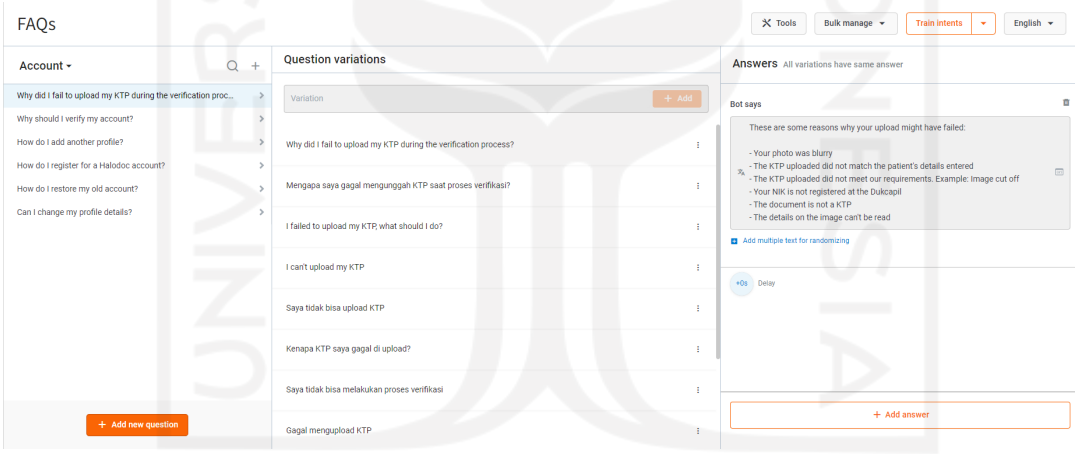
In the new proposed FAQs flow, we add intents to each of the questions which allow customers not only click the bot, but also be able to type manually. Here are some FAQs utterances for NLP samples.



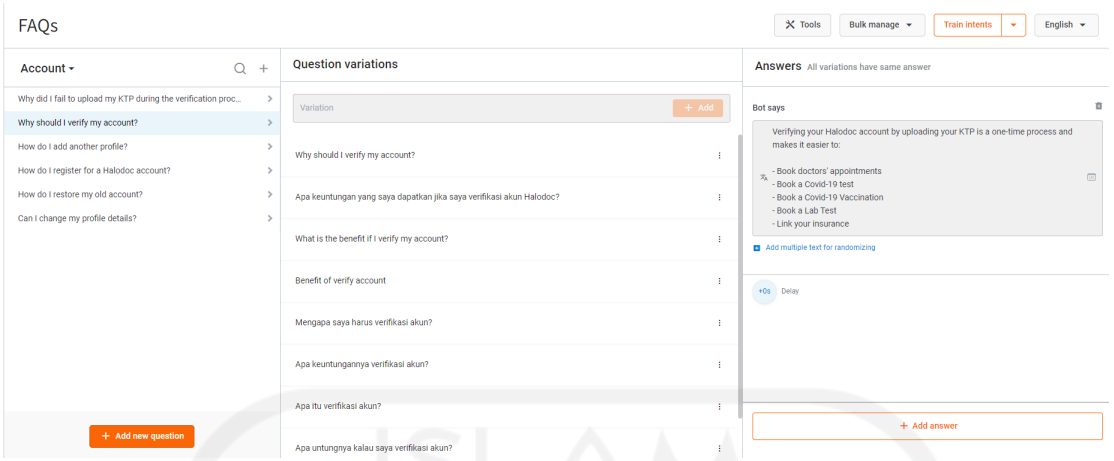
Picture 5.2. Proposal of FAQs Flow (Adding NLP to the Each of Question)



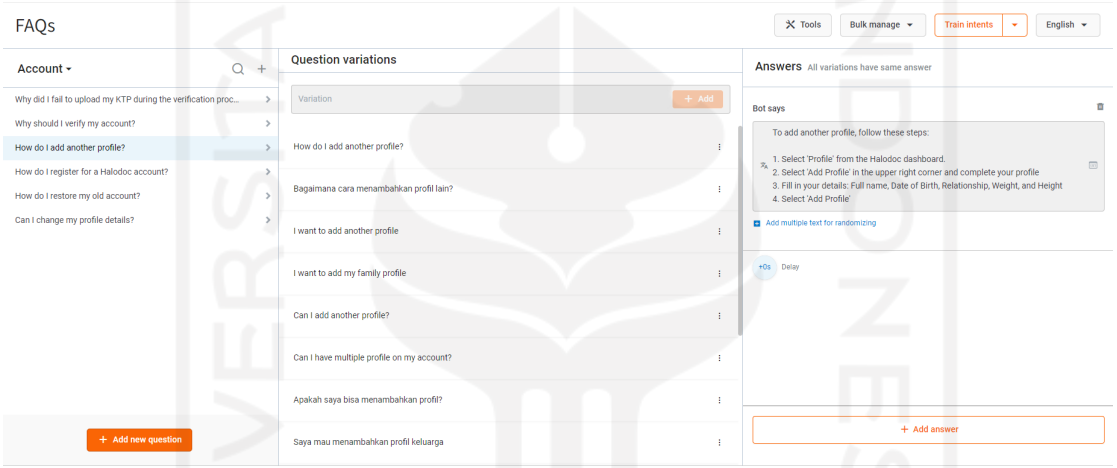
Picture 5.3. Proposal of FAQs Flow (Adding NLP to the Each of Question)



Picture 5.4. Proposal of FAQs Flow (Adding NLP to the Each of Question)



Picture 5.5. Proposal of FAQs Flow (Adding NLP to the Each of Question)



Picture 5.6. Proposal of FAQs Flow (Adding NLP to the Each of Question)

After implementing the new proposal flow above for FAQs journey. We are able to measure the Bot Accuracy by having this formula below:

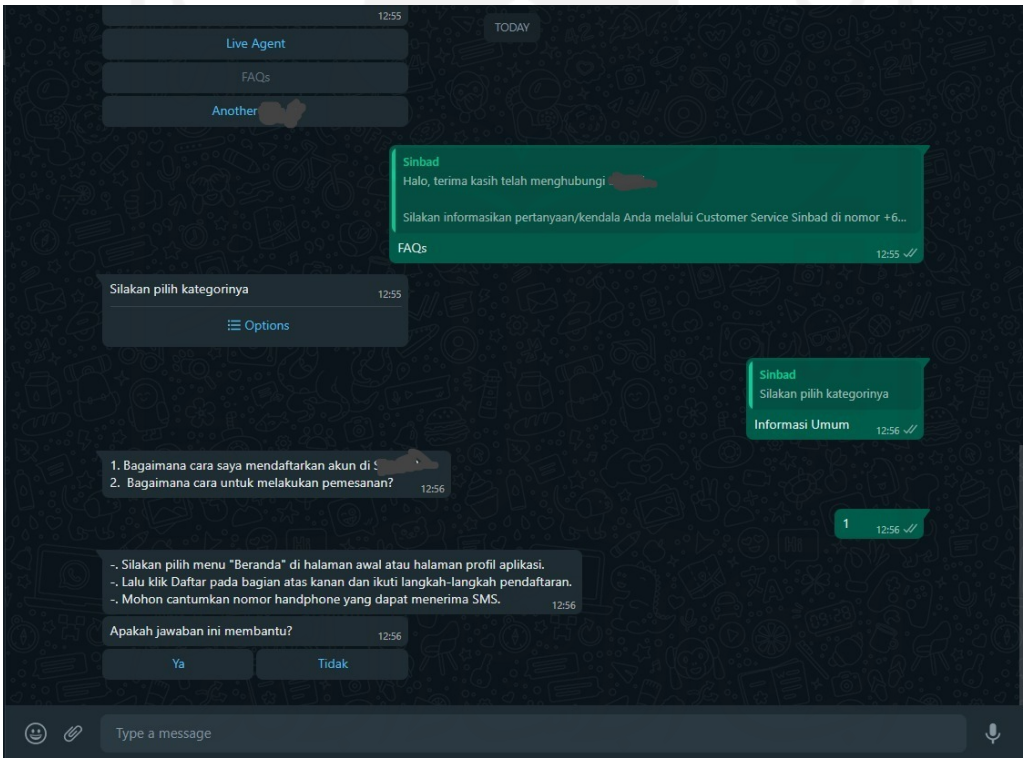
- NLP A = [1 - (Unidentified user messages / Total User Messages)]*100

No	Company	Unidentified User Message	Total User Message	Bot Accuracy
1	A	657	787	83.48%
2	B	3476	3992	87.07%
3	C	3212	3245	98.98%

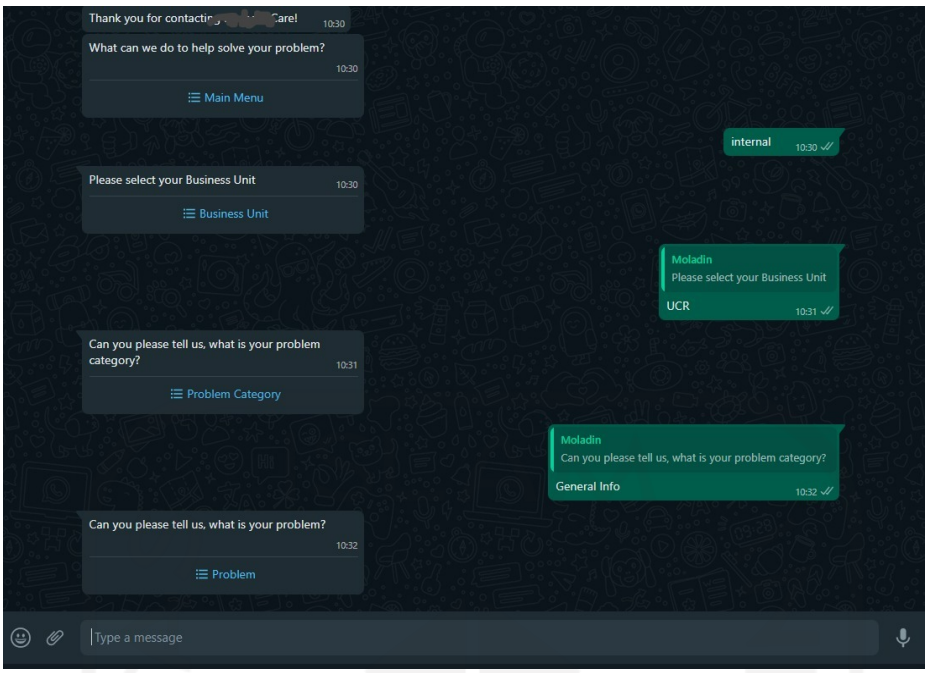
4	D	3002	3312	90.64%

Table 5.1. Result of the Proposal Flow of the FAQs in the Bot Accuracy

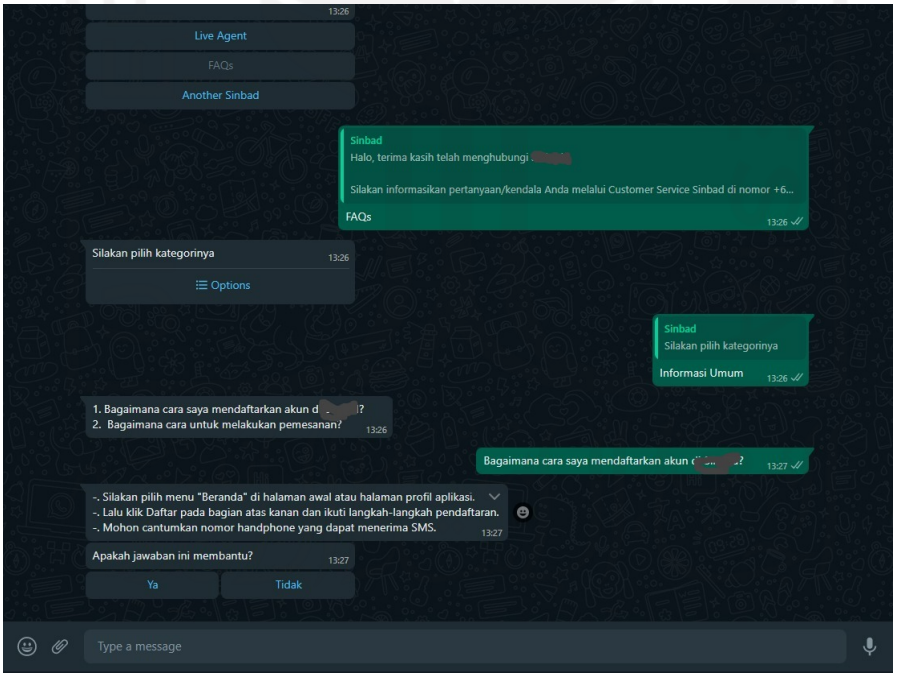
- Company A shows 657 Unidentified User Messages out of 787 Total User Messages, so it means that this has a **83.48%** number of Bot Accuracy %.
- Company B shows 3476 Unidentified User Messages out of 3992 Total User Messages, so it means that this has a **87.07%** number of Bot Accuracy %.
- Company C shows 3212 Unidentified User Messages out of 3245 Total User Messages, so it means that this has a **98.98%** number of Bot Accuracy %.
- Company A shows 3002 Unidentified User Messages out of 3312 Total User Messages, so it means that this has a **90.64%** number of Bot Accuracy %.



Picture 5.7. Sample of the Chatbot after implements NLP training



Picture 5.8. Sample of the Chatbot after implements NLP training



Picture 5.9. Sample of the Chatbot after implements NLP Training and Category of Questions

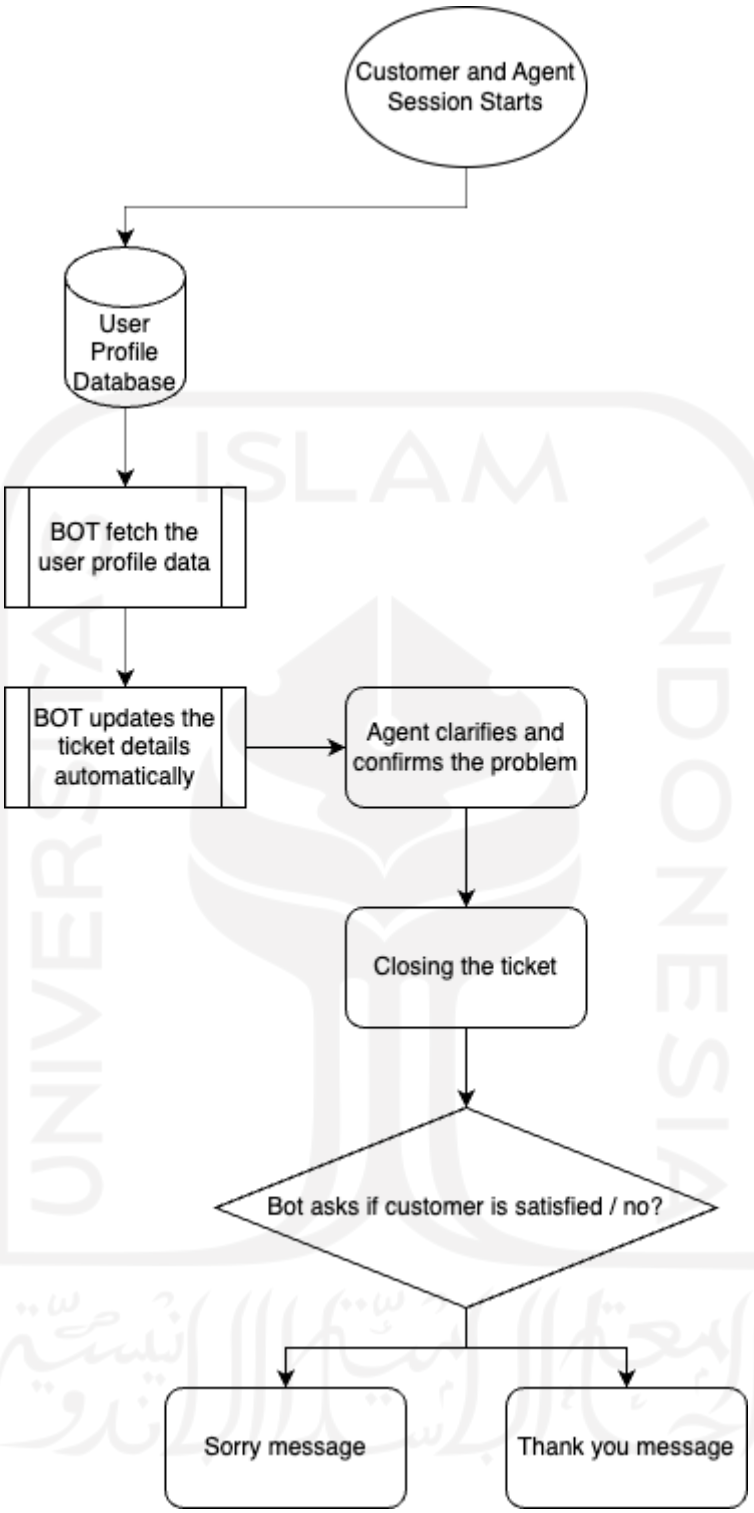
5.2. The Result of Improving Ticketing flow for the CSAT

As the ticketing flows, we come to know that the customers tend to be angry because they are unable to connect with the agent as soon as expected. We have come to know by this problem that the long questions from the BOT about collecting personal identifiable information (PII) data annoys the customers. Hence, it affects the satisfaction from the customers' side.

According to new research Pricilla et al., (2018), a proper goal for chatbot-based conversational commerce is effective use. The chatbot design with match style and behavior from the target users have been proven to be accepted by the users. This shows that there is a strong correlation between the proper design and customer's acceptance / satisfaction.

In research from Hsu and Lin (2023), an important consumer-facing application for businesses is the artificial intelligence (AI) chatbot, which has the potential to improve customer service effectiveness and save costs. However, very little research has attempted to evaluate the level of service they offer customers. In order to forecast users' pleasure and loyalty with customer service chatbots, this study applies the e-service quality by including conversational AI quality.

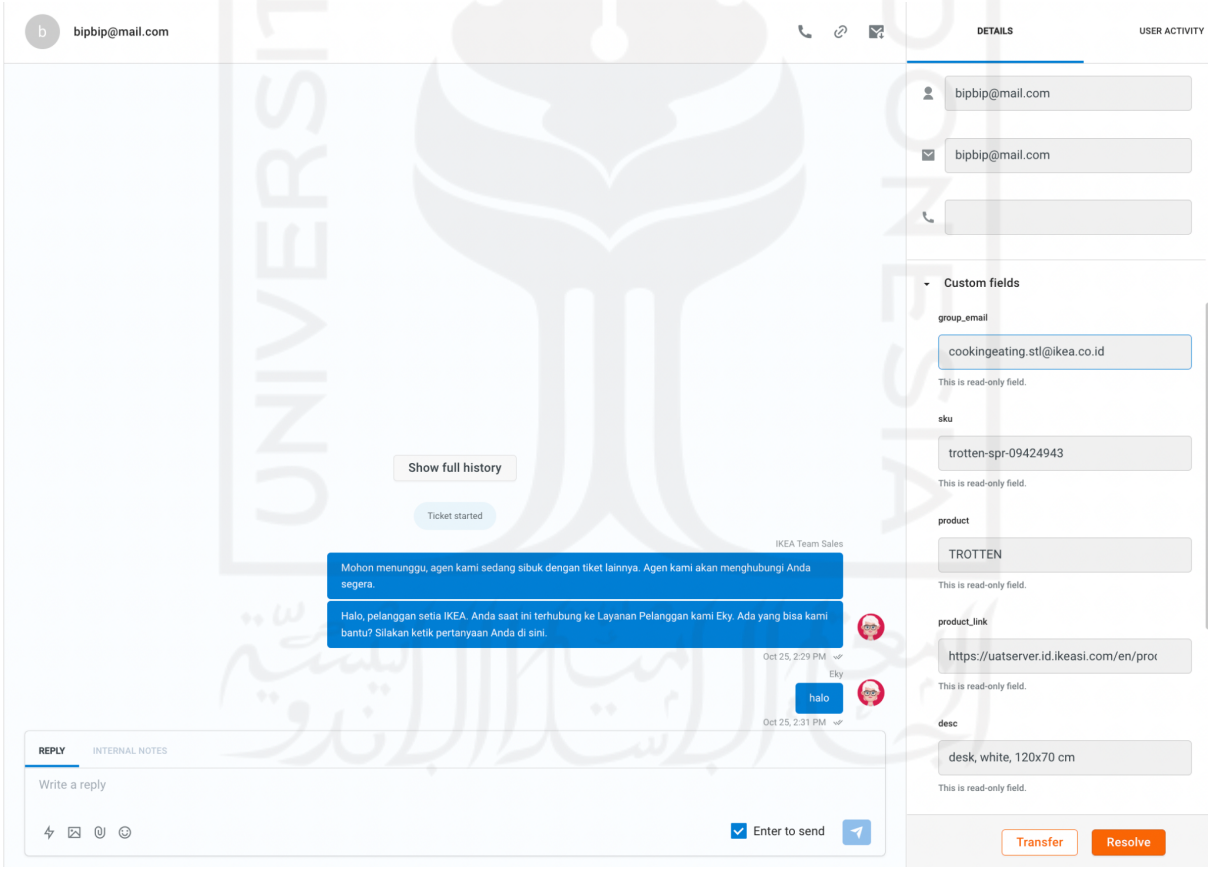
Customer Satisfaction Score (CSAT) requires a strategy from the customers about ticketing flow being captured by the BOT and not to lead the customers to be complicated. This ticketing flow will assist the customers' mood if it is simple, effective and quick. To make it simple and quick, we can create BOT by directly connecting the customers with the agent once the customers ask for it. Yet, it will not help the agents' duty as collecting the PII data before reaching to them. The best strategy is to make BOT able to ask the PII data once to the customers and memorize them using sender_id and help of records in the database. Hence, the next time a user from the similar sender_id comes in and expects to connect with the agent, we will directly recall the PII data stored in the database and use them for agents' perusal. On another hand, BOT will not necessarily ask the customers again.



Picture 5.10. Proposal Flow for Ticketing Flow (Utilizing User Profile and Auto Updating Ticket Details)

user_token	sender_id	updatedDate
5f487d34231cbe158bb[redacted]	5f487d34231cbe158bb105[redacted]	Mon Oct 03 2022 11:07:53 GMT+0700
373487185f919f4469a3[redacted]	2hn9elwng1hcic9[redacted]	Tue Sep 20 2022 14:02:51 GMT+0700
388e00261500060489812[redacted]	36fv017pi2yd97rc6[redacted]	Wed Sep 14 2022 16:22:40 GMT+0700
ff6a49d73e3947f85c4d3eef[redacted]	lc9suhbayplg3xiuhg[redacted]	Sun Sep 11 2022 22:55:58 GMT+0700
2a26813f4500dc637cde[redacted]	8eu91tizvshqqb4up[redacted]	Tue Sep 06 2022 09:52:24 GMT+0700
19828548533ab0cd425f1c11[redacted]	rn9nsncmnfh0kie[redacted]	Mon Sep 05 2022 15:17:26 GMT+0700
46cb6f06c3db0a5d3e[redacted]	nz5f7uoby5xw9bv[redacted]	Fri Sep 02 2022 15:51:25 GMT+0700
4d90c307d1171fd37b1f[redacted]	mpvmjs690inum68[redacted]	Thu Sep 01 2022 15:24:10 GMT+0700
cccc2a11eafaea2428bc75[redacted]	x6nsdx5echitszdu[redacted]	Thu Sep 01 2022 11:00:30 GMT+0700
27cb510dba93ec1d671e4[redacted]	thkfia8rh83cuch[redacted]	Thu Aug 25 2022 15:08:42 GMT+0700
25f3ca69985fa8c2cea3bd[redacted]	b3hx2lpj9zx098c[redacted]	Mon Aug 15 2022 10:04:55 GMT+0700
fee90b4174d8ecd4e390b6[redacted]	tektaisjs652ayt[redacted]	Thu Jul 28 2022 17:27:57 GMT+0700
2174a85ba5c7a2109522c48[redacted]	y71u92pjpzk15[redacted]	Thu Jul 28 2022 14:52:55 GMT+0700

Picture 5.9. Proposal of Ticketing Flow (Utilizing Memory Sender ID)



Picture 5.11. The Sample Chatbot that Utilizes User Profile Database and Auto Update Ticket Details

After implementing the new proposal flow above for ticketing flow. We are able to measure the Bot Accuracy by having this formula below: The metric of CSAT from these following companies are as follows:

No	Company	Solved	Total Data	Solve Percentage
1	A	921	952	96.74%
2	B	378	487	77.62%
3	C	242	337	71.81%
4	D	560	653	85.76%

Table 5.2. Result of the Proposal Flow of the Ticketing in the CSAT

- Company A shows 921 Satisfied out of 952 tickets, so it means that this has **96.74%** number of Not Satisfied customers.
- Company B shows 378 Satisfied out of 487 tickets, so it means that this has **72.38%** number of Not Satisfied customers.
- Company C shows 242 Satisfied out of 337 tickets, so it means that this has **71.81%** number of Not Satisfied customers.
- Company D shows 560 Not Satisfied out of 653 tickets, so it means that this has **85.76%** number of Not Satisfied customers.

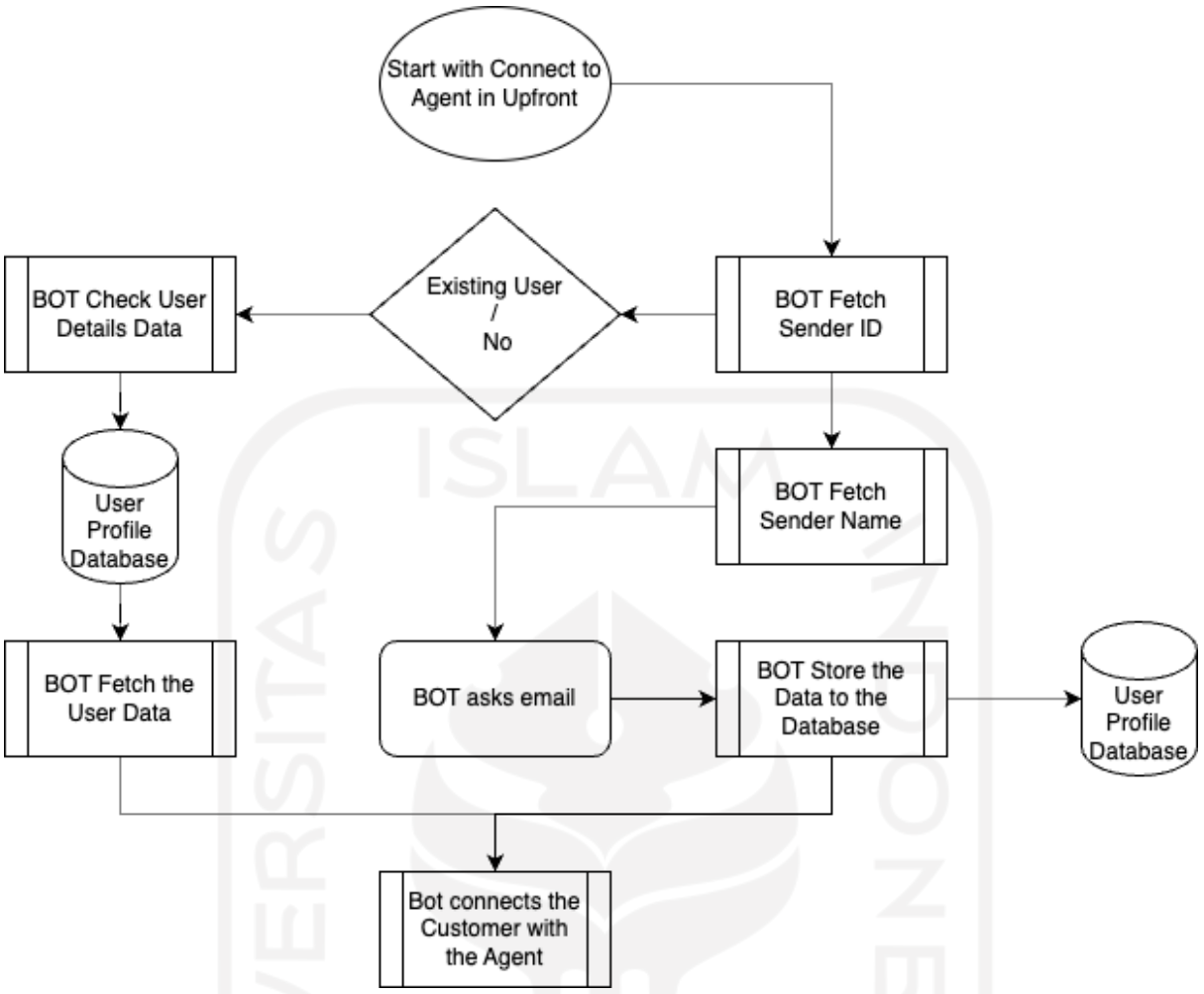
5.3. The Result of Improving Live Agent flow for the Journey Completion Rate

As the Live Agent flows, we come to know that the customers tend to be leaving the conversation or even stuck at the certain step because they are unable to connect with the agent as soon as expected and unable to find out how to connect with the agent due to many validations in the process, such as phone number, email, and even email. We have come to know by this problem that the long questions from the BOT about collecting personal identifiable information (PII) data make the customers leave. Hence, it affects the Journey Completion Rate.

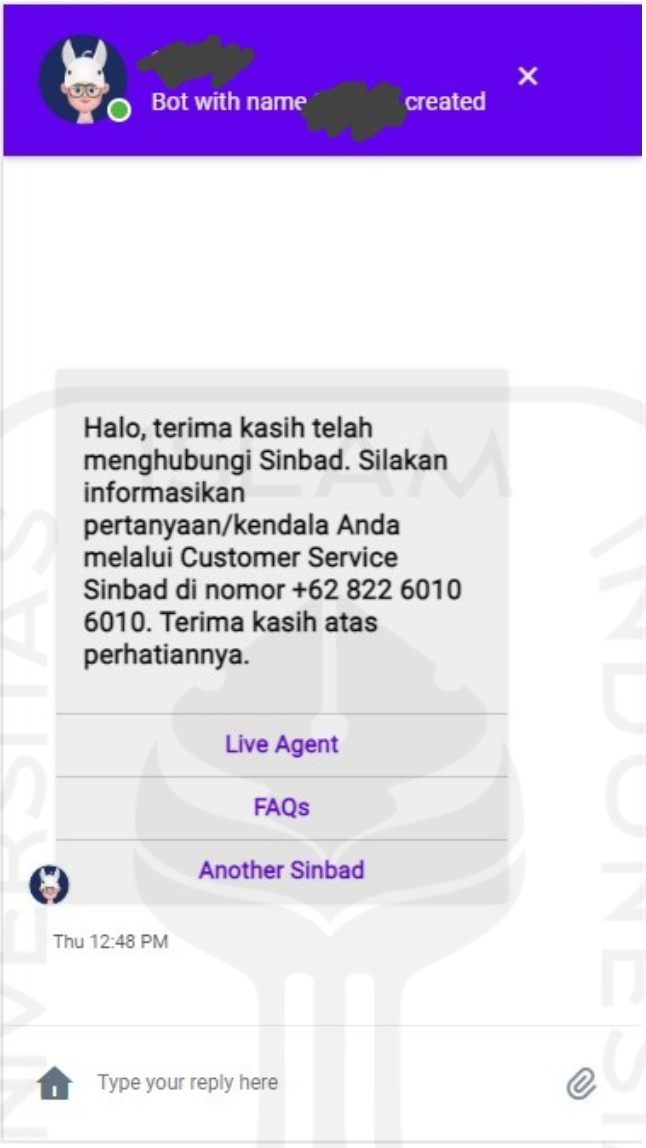
In research from Adam et al (2020), chatbot development serves as a first step in better understanding how anthropomorphism's impacts and the requirement for consistency in the context of electronic markets and customer service can be used to increase user compliance

with AI-based CAs. As a result, this research adds to what is already known about CAs as anthropomorphic information agents in customer-service. We anticipate that our study will serve as a springboard for further investigation into CA compliance controls and enhancing AI-based capabilities in and outside of electronic marketplaces and client self-service environments.

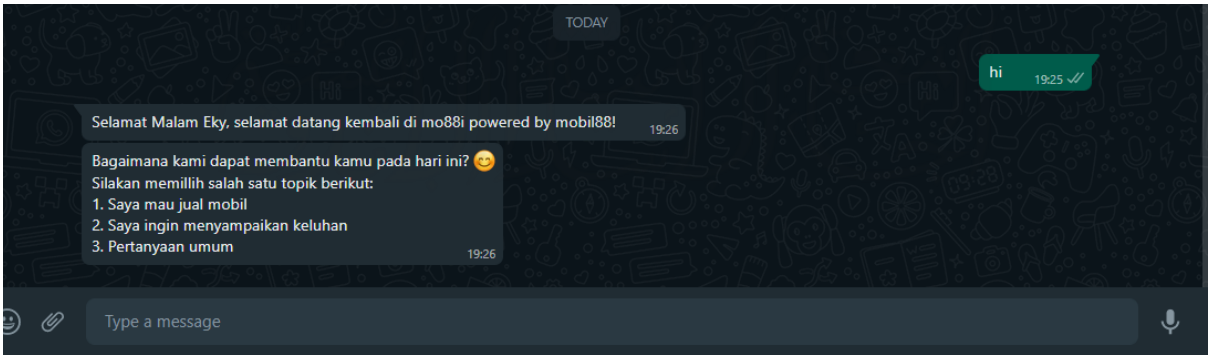
What we propose as an improvement is that there are 2 main real keys. First, we provide an option to connect with the agent directly as this is the most option that customers like to opt for. By having the option to connect with agents directly, it will improve the sensation for the customer to complete their intent within the journey due to they have what they seek for in the first display. Secondly, we understand that Personal Identifiable Information (PII) data is important for most enterprises. Hence, we provide a solution to still implement BOT questions for PII data, but at the same time it does not annoy nor make the customers leave the chat. The solution is to enable the memory from the BOT using the help from the database and fetch from sender_id.



Picture 5.12. Proposal of the Live Agent Flow



Picture 5.13. Sample Chatbot that Directly Provides an Option to Connect with the Agent



Picture 5.14. The Sample Chatbot (Utilizing Memory and Database of the User Profile)

No	Company	Journey Completed	Journey Hit	Journey Completion Rate
1	A	549	687	79.91%
2	B	678	756	89.68%
3	C	523	564	92.73%
4	D	512	524	97.71%

Table 5.3. Result of the Proposal Flow of the Live Agent in the Journey Completion Rate

Having already implemented the proposed flow, here are the results from the flow proposal for the Live Agent journey to activate more good reports. They are as follows:

- Company A shows 549 Journey Completed out of 687 Journey Hit, so it means that this has a **79.91%** number of Journey Completion Rate %.
- Company B shows 678Journey Completed out of 756 Journey Hit, so it means that this has a **89.68%** number of Journey Completion Rate %
- Company C shows 523 Journey Completed out of 564 Journey Hit, so it means that this has a **92.73%** number of Journey Completion Rate %
- Company D shows 512 Journey Completed out of 524 Journey Hit, so it means that this has a **97.71%** number of Journey Completion Rate %

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Based on the research objectives, there are 3 key measurements to evaluate the performance from the chatbot which are CSAT, Journey Flow Completion Rate, and Bot Accuracy. We have 3 journeys to be evaluated which include Frequent Questions Asked (FAQs) for CSAT, Live Agent for Journey Completion Rate, and Ticketing Flow for Bot Accuracy. Each flow has a different steps to reproduce before jumping into the solutions which includes:

1. The Natural Language Processing (NLP) and categorization for FAQs
2. The use of memory and database for Live Agent, and
3. The automatic fetching user personal information data to the ticket details and the use of memory in the database for Ticketing flow.

The new implementation from the FAQs, Live Agent, and Ticketing Journey's flowchart in chatbot system design have proven to increase the customer service performance. After implementing the new proposals in FAQs, Live Agent, and Ticketing Journey, we found that 4 commerce industries show progressive results which are shown by an increase of **24.93% in CSAT**, **15.5% in Bot Accuracy**, **and 17.8% in Journey Completion Rate**.

6.2. Recommendation

The author believes that there are several variables that can be added to extend the case of this research, such as:

1. The integration of this chatbot's flows with social media channels, such as Telegram, WhatsApp, Facebook Messenger, etcetera.
2. The integration of this chatbot's flows with internal company's funneling Database, in order to automate the leads generation.

3. The integration of this chatbot's flows with the internal company's Customer Relationship Management software, in order to automate the ordering system.

This research's recommendation will be more insightful and practical to the related commerce industries, because they have utmost softwares operating with their system.

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