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Smart Customer Care using AI-Based Approach

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***Abstract*—Artificial Intelligence is getting as smart as human and it is capable of replacing humans in many fields, for example, in medical and in education fields or in business. One of the reasons to use AI was for customers service and care. In this study, the researcher has developed a simulation program "Chatbot" to assist the authorities on the fishing license, by collecting some samples and information from a helpdesk center. The researcher then used this data to analyze and design responding format of the program, which was developed by Dialogflow and Python. Program efficiency and users' satisfaction can be examined through an evaluation form, with is classified into five rating scales with two points of view: program design and use as well as program response and accuracy. The program design and use are focused on efficiency, feature and process, chat design and reliable analysis. The results of the program design and use can be explained as follows: practical delivery was 4.35 in rating scales, while the program design and use were less. Chat feature was 3.55, while the overall satisfaction was 3.88, while the most satisfying result of answer and accuracy was its question repeating. Satisfaction in terms of the edited issue was 4.75, while the satisfaction regarding the answers and accuracy was at the lowest scale, 3.6 in the rating scale, with the same result regarding the capacity of the program to respond towards users. The overall satisfaction upon the answer and accuracy was 4.05, the result of both issues genuinely explains the satisfaction regarding the program design and use, focused on their feature and process, chat design and authentic delivery. Regarding the program design and use, since according to the study the answer and accuracy were 3.9, the researcher reached the conclusion that the program still needs better development in order to work more efficiently on both aspects, program design, and efficiency as well as to minimize errors as much as possible.**

***Keywords*— Chatbot, Customer Care, Artificial Intelligence, National Language Processing**

I. Introduction

The technology of Artificial Intelligence (AI) [1], one of the fields studies of science and engineering, has recently become a well-known subject in today's society because it is extremely intelligent, similar to human intelligence, and it can even assist humans in many areas of human work. At present, AI is getting more and more developed and involved both in organizations and business sectors today [2, 3, 4]. No matter whether in the public or private sector.

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AI is also developed to reduce workload and human resources [5, 6]. AI consists of diverse fields, as a result, it becomes a technology innovation of machine learning [7, 8].

Machine learning, one of the related technologies in AI, has been developed into a Chatbot [9] or computer software, its target is to simulate a human communication and develop electronic devices capable of understanding and respond in human language. In the past, developing a Chatbot had not been efficient enough to play a good role in business; with AI and machine learning approach, it is nowadays much more advanced and developed.

Furthermore, natural language process is also a part of its better response to human language [10]. Chatbot development has been advanced, as a result, several business sectors are more open, getting "Chatbot" involved in customer service, problem consultant, etc. Chatbot nowadays is as widely known as online applications such as Line or Facebook. Therefore, there is no doubt that nowadays, Chatbot is widely accepted among several organizations.

In general, most companies or organizations need to provide after-sales service to assist and address customers' problems. If assistance and giving service are required, salespersons are supposed to be on duty for any problems solving and reply to customers through online applications. Sometimes, salespersons cannot avoid replying to repetitive questions, and since they cannot reply to all customers at the time, as a result, it may cause some troubles later.

Regarding the case above mentioned, the researcher came up with the idea of using AI in order to help to develop a simulation program, which assists authorities especially in case of questions service on issuing fishing licenses. It will also without any doubt help saving time.

II. Background and Related Works

A. *Artificial Intelligence*

AI [1, 11] is one of the newest branches in science and engineering, it was developed to study human's thinking process and habits through computers. the purpose was trying to develop a computer as smart as humans. Many scientists were interested in the study of AI, they have developed it into various branches, from general study throughout deeper details. For example, developing a game with AI in order to investigate and record gamers' habits, developing mathematics theories, using it to assist in business or even perform as a consultant and so on.

There are several definitions for AI [12], it can be divided into different fields together with the main points as follow: human thinking [13], critical thinking [14], human action, and logical action [15, 16]. Besides these, the study of AI consists

of two main parts namely, machine learning and deep learning. Machine learning [7, 17, 18] is focused on simulating and learning about the human brain functions and human habits in order to find out a learning function that is closest to humans. Deep learning [19] is a study of the mathematical model of brain cells that are closest to humans and widely known.

B. *Natural Language Processing*

Natural Language Processing (NLP) [11, 20] was developed to support computers to better respond to human language. The study was aimed to develop better communication and to synthesize language processing. In general, computers were unable to respond to human language, because humans have complex and diverse languages. Therefore, to meet the needs and make computers become smarter, it was necessary to develop the study of language data analysis in order to reduce the gap in communication between humans and computers.

NLP consists of six steps as follows [21, 22]: the process of the morphology which separates words into letters, searching for consonants, vowels, and spelling. The next step is the process of understanding the meaning, at lexical level. Next, syntactic level, which is based on the understanding of words and the structure orders of learning word patterns. The semantic level is a pattern of making computers better understand the meaning in each of the complex structures. Discourse level is the step of comprehension from previous and advanced sentence structures. It identifies different context uses as well as word orders which can change the meaning of the words in a sentence. The last step is the pragmatic level which is about understanding the meaning of words and sentences in reference to a context or background knowledge in order to catch the meaning, as humans do.

C. *Chatbot*

Chatbot has been developed from AI [23, 24], it is a kind of applied software, aiming to imitate human communication. In terms of program processing, it was set to configure each question and answer in advance. Chatbot was designed to interact with letters or words and imitate human habits [25, 26]. Those can be explained into two types: retrieval-based model, which was designed to figure out habits in anticipatory conditions, analyzing a communication based on its related contexts. The second type is generative model, which learns from basic inputs and uses diverse branches of science to make computers similarly smart like humans.

D. *Related Works*

Hill et al. [27] have conducted a study about communication between humans and Chatbot. They aimed to find out whether there was a difference by focusing on the number of letters, word types, and symbols. The result showed that humans spent a bit more time on it than computers do, but in terms of sentences or words using, those were shorter than usual. Communications between human and Chatbot usually use fewer words than between humans together, but, communications between human and Chatbot usually use more academic words.

M. C. Agency [28] conducted a study of consumers' attitudes toward Chatbot. According to the study, the researcher collected some samples of problems from salespersons. Some salespersons could not give information or company details, and they could not answer fast enough even to basic customers' questions. As a result, the researcher brought Chatbot to solve out the issue. Clearly, Chatbot could be on duty throughout the day. It could service customers for basic information. Furthermore, it was a second network connection to several organizations, but it was still far from Face-to-Face, it was comfortable and faster. Besides, there was no problem with the different ranges of ages. However, a serious problem was found, Chatbot could not catch up and understand some of the questions asked.

According to several studies, the researcher reached the conclusion that interaction between human and Chatbot take more time than between human together; customers preferred to use common words or short sentences because it seemed to be much easier, comfortable and they felt free to use casual words. In contrast, the time spent interacting with Chatbot seemed to be shorter and it could spot customers' attention to it. As additional advantage, Chatbot could be on service throughout the day. However, there is a serious problem, Chatbot is still not able to access human through messages.

III. Method

The purpose of the study was to develop a Chatbot which the researcher designed as a replying Chatbot format with AI-based approach. Further on, the researcher would take the same pattern and apply it in business sectors; the Chatbot was developed to assist the staffs in replying to customers, especially in cases of system errors. In case of a requested changes in a license, the Chatbot seemed still to have limitations when used: the program was developed to support Thai and some keywords in English only. There is a rule of making a reply of E-license, based on data collection from a help-desk center. The concept of the Chatbot is shown as Fig.1.

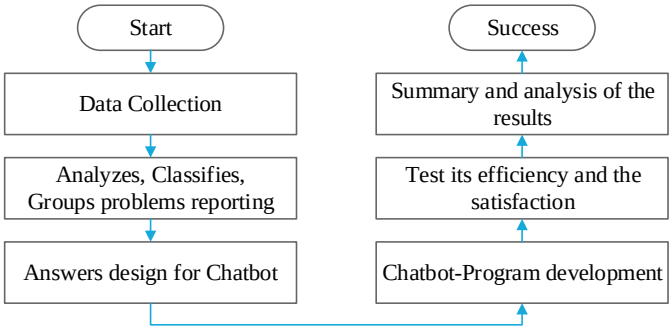

Figure 1. Conceptual framework.

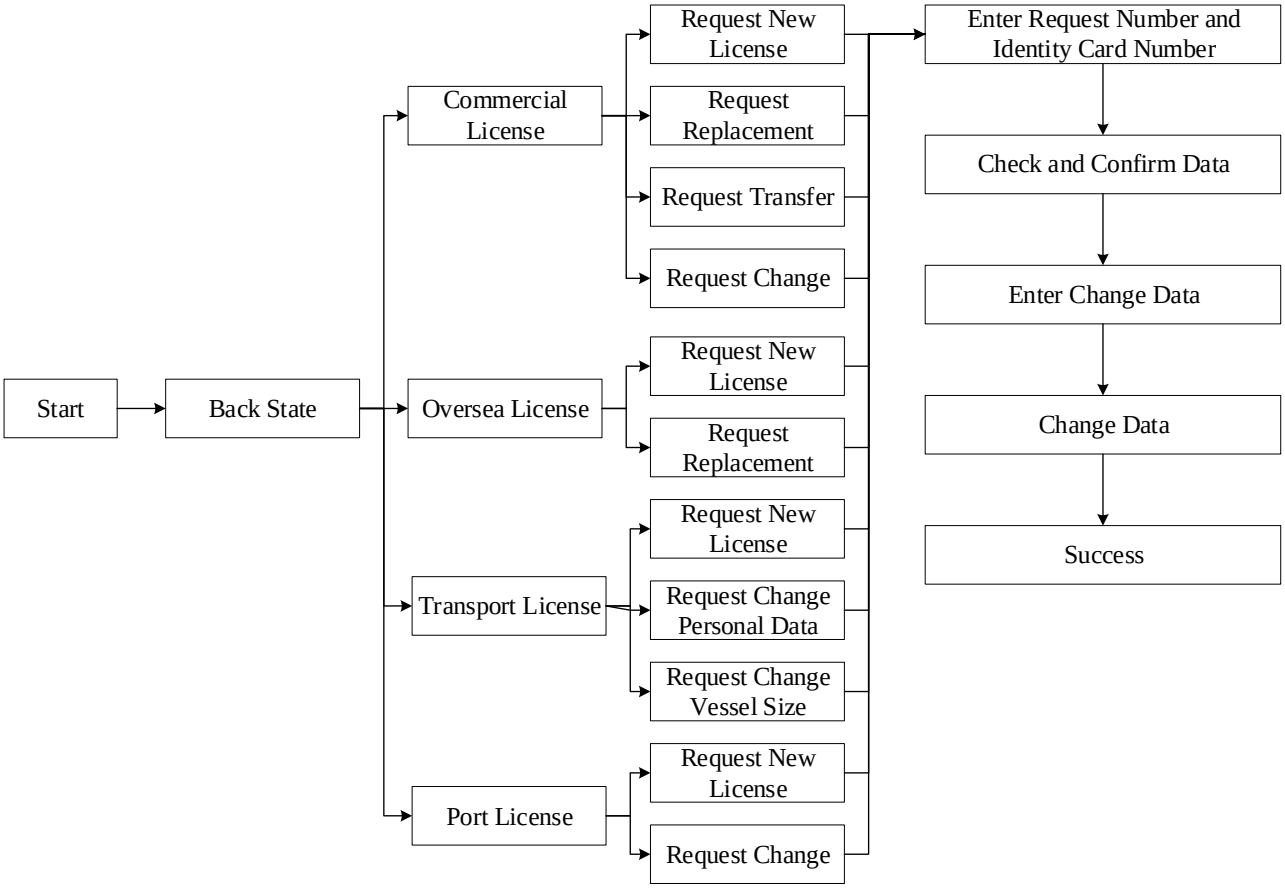

Figure 2. Rules for answer and request.

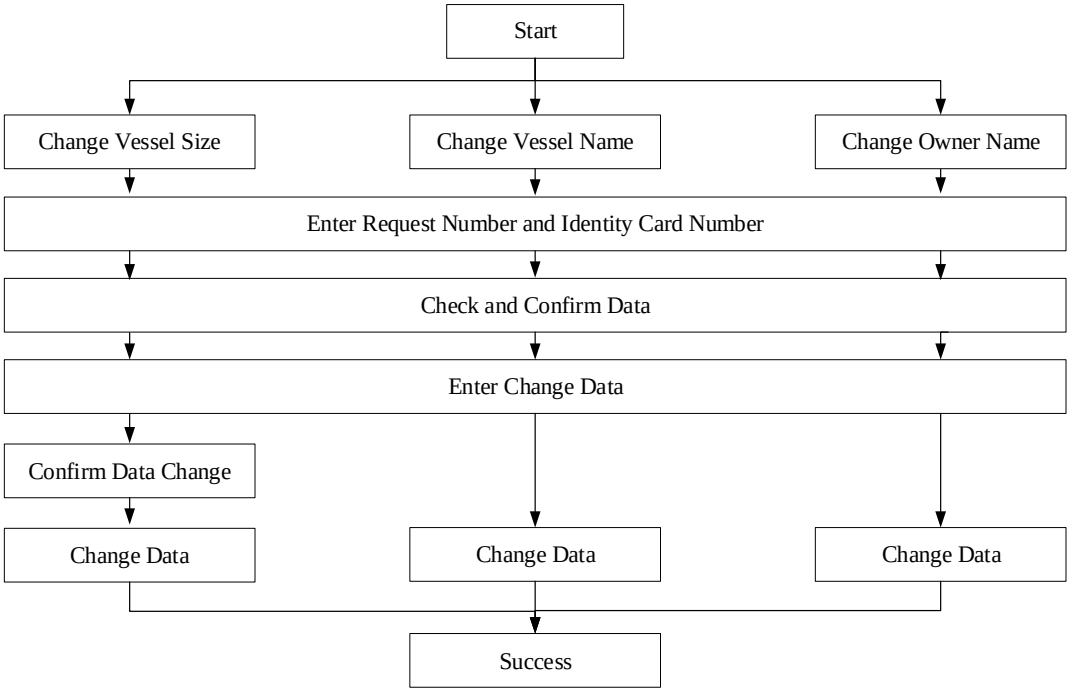

Figure 3. Answer rules for changing the information in the license.

Fig. 1, the explanations as follows:

- The researcher collects the sample problems reported by a helpdesk center while the program was used for the fishing licenses.
- The researcher analyzes, classifies, groups the problems reported and asks about the program functions.
- Then the researcher brings the sample questions and designs, their format and program functions with AI-based approach, for answering the questions as well as the diagram for Chatbot development, as shown in Fig. 2 and 3.
- Design a Chatbot with Dialogflow and connect it to online application Line, for the test shown in Fig. 4 and 5.
- Test Chatbot efficiency and the users' satisfaction by samples gathered from the purposive sampling.
- Summary and analysis of the result.

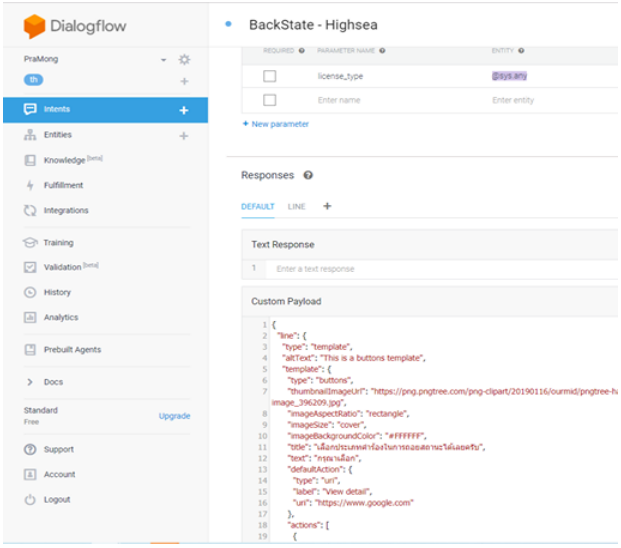

Figure 4. Chatbot designed with Dialogflow application.

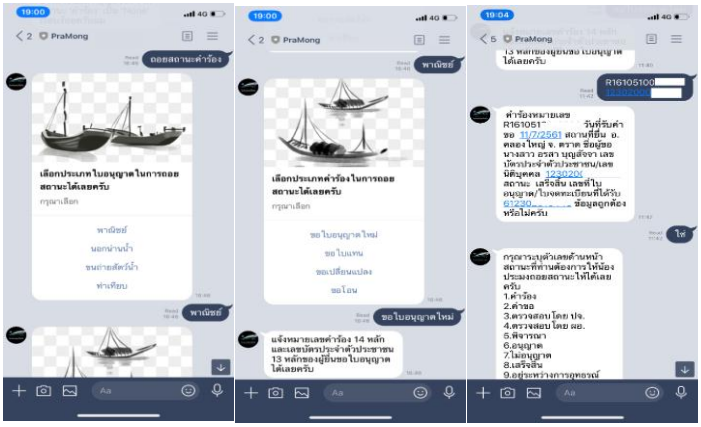

Figure 5. Connection on Line for the test.

IV. Experimental Evaluation

A. *Dataset*

The data collected for this research came from problems reported and the use of the fishing licenses came from precise user data collected by a helpdesk center. The data was collected from April 16th, 2018 until January 14th, 2019, it has not yet been analyzed and distributed.

B. *Sample Data*

The sample data will consist of 20 people from a total of 41 people, who are the employees of Trinity Roots Limited company, those persons will be accidental sampling. The sample group consists of staff members in positions of developers and business analysts.

C. *Performance Evaluation*

The researcher has developed the program in order to meet the needs of users - which have already been analyzed - and designed as such; then the program developed has been tested for its ability and users' satisfaction toward Chatbots by a twenty-member of the sample from software developers and business analysts. The researcher used the questionnaires, five rating scales, Leiker's method [29], upon the two following points of view: program design and use, then the researcher summarized the results by using the average statistics.

D. *Results and Analysis*

The Chatbot with which the researcher conducted a study on advising the staff for the use of the fishing licenses has tested the effectiveness of the program by considering two aspects as follows: the first one was about program design and use, following with the answer and accuracy of the Chatbot. Regarding the satisfaction of users, the researcher focused on the pattern's usage, features and design, Instructions, conversation style and the authenticity of delivery. In contrast, if we talk about answers and accuracy, the researcher focused on the users 'comprehension, question classification, accuracy and received answers and the results as the following in Fig. 6 and 7.

From Fig. 6, test results of program design and use were as follows: the most satisfying issue was an authentic use of Chatbot with an average of 4.35, following with the program that was easy in terms of use and also its format, and the satisfaction average was 3.85. The issue with the least satisfaction was its feature, the satisfaction average was 3.55.

From Fig. 7, the test results of answers and accuracy were as follow: The most satisfying issue was that the Chatbot normally repeated questions. There was satisfaction on the edited issue with a result of 4.75, following with classifying of requests, licenses and other important information with an average satisfaction of 4.45.

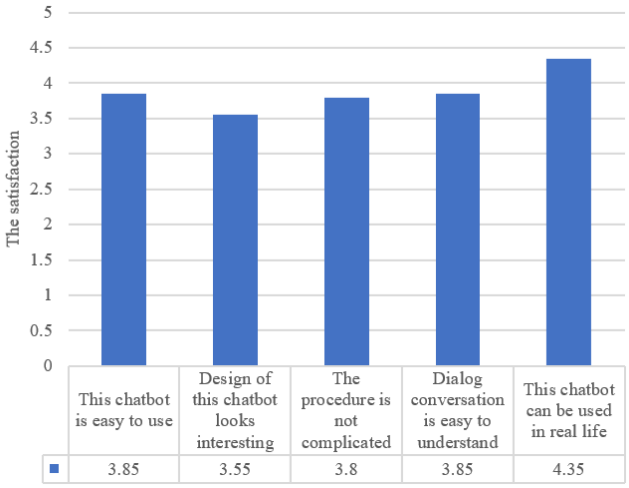

Figure 6. The results of users' satisfaction on program design and use.

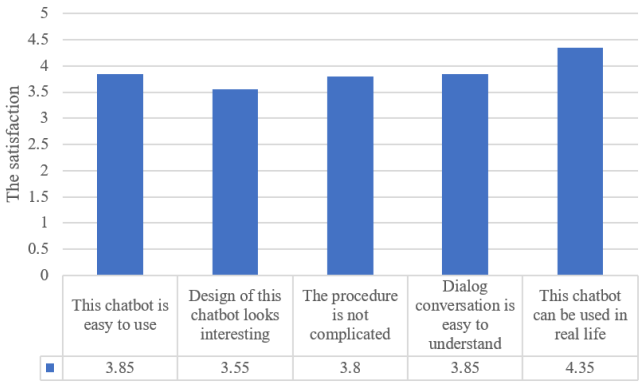

Figure 7. The results of users' satisfaction on program design and use.

Next, was about Chatbot correct response, with 3.75 as satisfaction average. However, the issues with the least satisfaction on answers and accuracy was that the Chatbot normally caught up the questions that users sent, with 4.05 in the rating scale. the overview of the evaluation of satisfaction of answers and accuracy was 4.05 in the rating scale.

v. Conclusion

This research was conducted to create a Chatbot to help the staff in advising customers regarding fishing licenses and the other point was to make the service more effective and faster. For data collection, the researcher collected the problems of the system from a helpdesk center. The researcher then analyzed and distributed the data and designed an answer format to develop a Chatbot. In the part of testing the program efficiency, the researcher used the satisfying evaluation form, based on five rating scales through two points of the view: program design and the other one was answers and accuracy. The pattern evaluation of satisfaction was focused on the program format, its features, and program use, chat format and authentic delivery. The evaluation of the pattern of answers and accuracy was focused on comprehension, questions categories, information repeating, accuracy and question response. According to the results of program design and use of which most satisfying issue was the authentic delivery, 4.35 in the rating scale, while the least satisfying of its was the feature, 3.55 in the rating scale. The overview of program design and use was 3.88 in the rating scale.

As satisfactory result regarding answers and accuracy, the most satisfying was the Chatbot question repeating. Regarding the edited issue notifying, its satisfaction was 4.75. The issue with the least satisfaction was about answers and accuracy which result was 3.6 in the rating scale. The overview of the evaluation of answers and accuracy was 4.05. In contrast, the overall satisfaction of both program design and use as long as the answer and accuracy and question response was 3.97. So far, the researcher has noticed that the developed Chatbot still needs ongoing development to minimize errors and make the Chatbot work as efficiently as possible. As for the study, it was only a sample of problems that the researcher has chosen and used to design the appropriate functions of the question's responses to develop a Chatbot. To test the program efficiency and satisfaction, the Chatbot needs ongoing development. to cover all customers' doubtful questions, the researcher will next collect more details and develop another smarter Chatbot.

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