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Master of Information Systems

BERIN, KEVIN RON F.

SSS MEMBER PERSONALIZED INQUIRY CHATBOT SYSTEM

Thesis/Dissertation Adviser:
Ria Mae Borromeo
Faculty of Information and Communication Studies

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Kevin Ron F. Berin

Student Name over Signature and Date

This Special Project titled

SSS Member Personalized Inquiry Chatbot System

is hereby accepted by the Faculty of Information and Communication Studies in partial fulfillment of the requirements for the Master of Information Systems.

Ria Mae H. Borromeo
Adviser
4 November 2021
Date

Concepcion L. Khan
Program Chair
2 MAY 2022
Date

Alexander G. Flor
Dean
Faculty of Information and
Communication Studies

Date

ABSTRACT

The core problem investigated in this thesis is the overwhelming number of questions and complaints of the Social Security System members due to lack of information dissemination from the start. Employees in the Member Communications and Assistance Department is having a hard time dealing resulting in overtime and shifting schedules. Realizing this, the study has created a system to cater massive inquiries of members.

Chatbots are the new support to reach out customers. With its connectivity through different platforms, especially Facebook, members with mobile phones or even laptops have ways to communicate to SSS.

The Methodology used is effective in this study not only it is fast. The stakeholder identifies the failures, errors, bugs while monitoring and using the system for the development team will add into their next system update.

SSS-MPICS Implementation shows the sign of productiveness that not only saves more resources from Social Security System. The developed system also addressed the issue of the people rendering overtime to finish quotas of member inquiries. The productivity increases even employees not rendering overtime.

Social Security System in the future possibly implements new kinds of benefits and financial assistance. Also, Chatbots are still evolving until now in order to be a more interactive and easier to use. With this, future improvements of services of SSS-MPICS will be required. Therefore, the chatbot must be updated to cope up with the trends and services of Social Security System.

ACKNOWLEDGMENTS

Foremost, I give thanks to God for protection and ability to do work. I give thanks to the Lord our God who lead me to this point. In giving me favor when things are getting out of hand.

I would also like to give my outmost gratitude to UPOU. At first, for making it possible to study my master's degree at a great University. This course has pushed me to my limits, and it made me wiser than I am before. I am also thankful to my advisor Dr. Ria Mae H. Borromeo for the support of my master's degree. Her understanding and guidance helped me reminded of my requirements and deadlines and to focus on the project.

I thank Social Security System for allowing me to conduct my study on them especially to the manager of Member Communications and Assistance Department, Fernando Nicolas and my manager Robert Clemente for helping me reach out to Member Communications and Assistance Department.

I would like to give my appreciation to my girlfriend since the creation of the proposal, now wife to this point in time, Wilma. Her unwavering support and ideas helped me to reach at this point. I also thank my family and my wife's family who supported and prayed for me throughout the time of my research. This thesis is heartily dedicated to my mother who is already in heaven

God bless to all of you.

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Dedicated to:
My late mother Benilda F. Berin and My Wife, Wilma B. Berin

Chapter I

INTRODUCTION

Social Security System (SSS) is a government agency that offers financial services in times of need such as Loans and benefits, such as Sickness, Maternity, Disability, Death and Retirement. SSS has 50 million registered members and half of it are active on their SSS membership. When the time of need arises, SSS members apply for these services and financial offers. In nine years in service of the proponent as a Software Developer in SSS, Information from application requirements, the status of application and the amount that will be received are the things that members frequently ask. Therefore, the majority ask different questions at the same time to SSS in a massive volume.

These questions and follow-ups result in creation of a department named Member Relations Department (MRD) now Member Communications and Assistance Department (MCAD). The department has employees that answer member inquiries through SSS Hotline, SSS Registered Email Service and SSS Facebook Page. Each employee of MCAD has a quota for each employee. MCAD employees has day and night shift, functioning 24 hours, 5 days a week to answer inquiries of SSS members in all channels. The biggest problem is that SSS could not eliminate all the questions even answering them more and more pops up. Same goes with email inquiries.

The purpose of this study is to leverage the capability of SSS to answer most of the most asked questions by the creation of a system named Social Security System – Member Personalized Inquiry Chatbot System (SSS-MPICS). The project is derived by the proponent due to the everyday observations of member inquiries from relatives

and other persons who will contact an SSS person regardless of the department to ask about different cases of their SSS concerns. For instance, the number of contributions of the member to avail salary loan. Another is and whether the member can avail salary loan again. Also, the type of applicable benefit that the member can get or simply, asks for their SS Number.

Derived from “chat robot”, "chatbots" allow for highly engaging, conversational experiences, through voice and text that can be customized and used on mobile devices, web browsers, and on popular chat platforms such as Facebook Messenger. SSS-Member Personalized Inquiry Chatbot System or SSS-MPICS is a chatbot that is always available, automatically reply to SSS members' personal questions and inquiries regarding their: contributions, salary loans, benefits and eligibilities. It analyses the member’s inquiry then look for keywords to search then get the answers from SSS records. The chatbot will help in delivering prompt and accurate response to inquiries. The system can even give clickable options to the member for easier inquiry. [1]

The Facebook account of member will be linked to their SS account and it is by one SS number per Facebook account. Upon greeting by the chatbot, it will require member’s SS Number and One-Time Password for security of member’s information. It minimizes human intervention that it can ease mundane workload of Member Communications and Assistance Department (MCAD). Members that ask information to SSS employees will be lessened. The members will be satisfied because of its fast reaction time.

Chapter II

REVIEW OF EXISTING ALTERNATIVES

This chapter should be able to present the following in not more than 600 words: description of how users/clientele currently cope with the problem; assessment of the best available resources for addressing the problem; and description of how your project stands out in comparison to the existing alternatives.

MCAD uses the actual account of official Facebook Page named Philippine Social Security System for answering comments and chats. For email inquiries, the department is using an official SSS email for members named member_relations@sss.gov.ph. Employees in the Facebook page team and email team in MCAD logs into these official accounts at the same time with different computers. They currently have a quota for answering inquiries of members in Facebook page and emails. They even doing overtime to cope up with the inquiries. While answering several inquiries per day, there are more members still inquiring therefore, it is almost an endless loop.

MCAD also has educators employed that explains all about SSS to employers. If all employers are educated, they can teach what they learned to the employees of their respective companies thus the inquiries can be lessened. However, only the members who are employed are currently supported by this program of SSS.

Members continue to seek information via phone call, email and through SSS' Facebook page. SSS has subsystems inside the website to cater member's inquiries that gather information through the database for their needs. The proponent can take advantage of the part of data gathering that can be implemented in the chatbot.

Another advantage is the chatbot is a cheaper alternative because of its lower operations cost when implemented, lesser manpower for repetitive and frequently asked questions at the same time, provide excellent service on SSS members by providing immediate support.

Chapter III

PROJECT DETAILS

A. Overview

SSS-MPICS is a chatbot that answers most of the member's inquiries in relation to their SSS services and benefits.

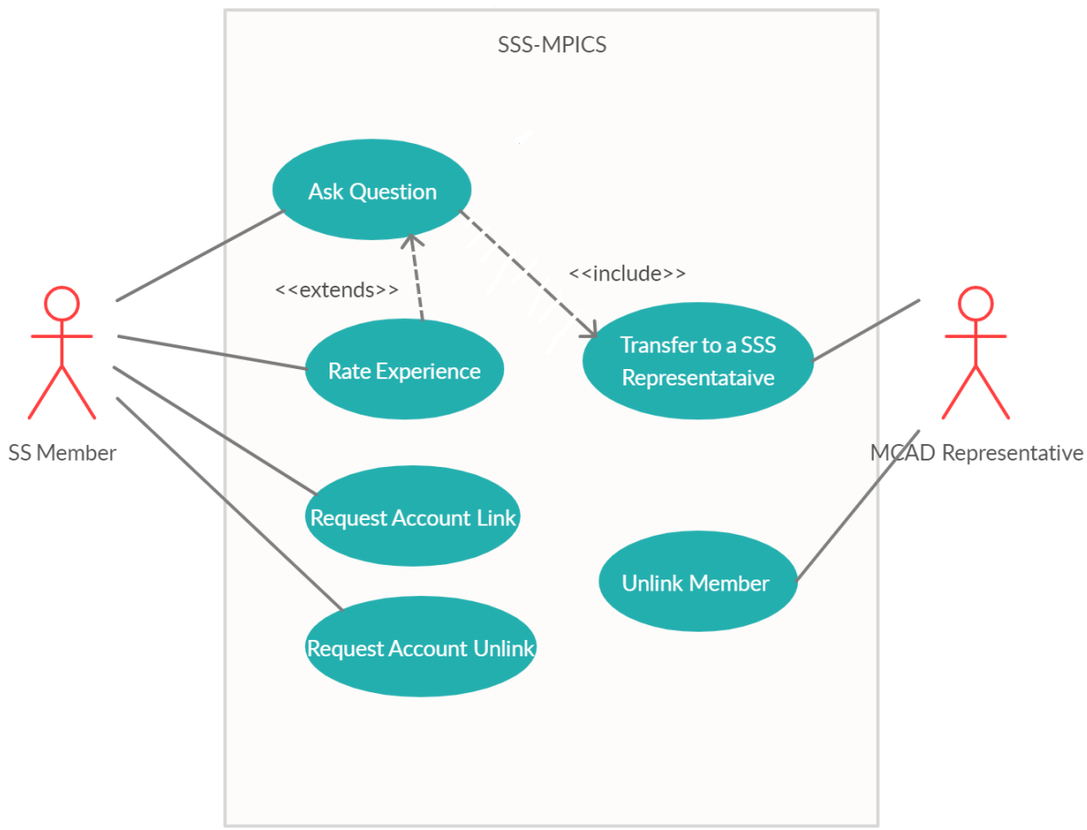

Fig. 3.1 Use Case Diagram for SSS-MPICS

B. Theoretical Framework

The proponent identifies the information theory that will be used beneficially for the project.

Agile Scrum Methodology. Scrum is a lightweight agile project management framework with broad applicability for managing and controlling iterative and incremental projects of all types. It is simple, proven productive, and able to act as a wrapper for various engineering practices promoted by other agile methodologies. With Scrum methodology,

the “Product Owner” works closely with the team to identify and prioritize system functionality in form of a “Product Backlog”. The Product Backlog consists of features, bug fixes, non-functional requirements, etc. – whatever needs to be done in order to successfully deliver a working software system. With priorities driven by the Product Owner, cross-functional teams estimate and sign-up to deliver “potentially shippable increments” of software during successive Sprints, typically lasting 30 days. Once a Sprint’s Product Backlog is committed, no additional functionality can be added to the Sprint except by the team. Once a Sprint has been delivered, the Product Backlog is analyzed and reprioritized, if necessary, and the next set of functionalities is selected for the next Sprint. [2]

C. Technologies Used

The proponent will use technologies that is related to the study such as:

a. Application Layer

Node.js. Node.js is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. Node.js' package ecosystem, npm, is the largest ecosystem of open source libraries in the world. [3] Node.js is vital to the project due to its purpose of its code in the AI server to fetch incoming chat.

Dialogflow. Also known as API.AI, Dialogflow is a chatbot platform and an AI server that provides features and integrations and a different level of usability. [8] In order to start a conversation with an agent, the user needs to invoke the agent. A user does this by asking to speak with the agent in a manner specified by the agent's developer. For the Agent to understand the question, it needs examples of how the same question can be asked in different ways. Developers add these permutations to the Training Phrases section of the intent. The more variations added to the intent, the better the agent will comprehend the user. An intent houses elements and logic to parse information from the user and answer

their requests. The Agent needs to know what information is useful for answering the user's request. These pieces of data are called entities. Entities like time, date, and numbers are covered by system entities. Other entities, like weather conditions or seasonal clothing, need to be defined by the developer so they can be recognized as an important part of the question. Dialogflow sends this information to the webhook, which subsequently fetches and parses the data needed (per project development), determines how it would like to respond, and sends it back to Dialogflow. With the formatted reply "in hand", Dialogflow delivers the response to user. [4]

Ngrok. Ngrok is a multiplatform tunnelling, reverse proxy software that establishes secure tunnels from a public endpoint such as the Internet to a locally running network service while capturing all traffic for detailed inspection and replay. [5]

Facebook for Developers. Facebook for Developers is a separate website dedicated to people developing apps using Facebook APIs or one of the platforms, including Messenger. [5] The proponent uses this as intermediary between Facebook and the chatbot.

Heroku. Heroku is a container-based cloud Platform as a Service (PaaS). Developers use Heroku to deploy, manage, and scale modern apps. [6] An add-on of Heroku for database is named ClearDB MySQL. The proponent uses this platform for user acceptance testing of the chatbot in a production environment.

b. Database Layer

MySQL. The MySQL Database powers the most demanding Web, E-commerce and Online Transaction Processing (OLTP) applications. MySQL delivers the ease of use, scalability, and performance that has made MySQL the world's most popular open source

database. [7] The proponent will use MySQL for presentation purposes of storing data fetched by chatbot.

c. Client Layer

Facebook/Messenger. Clients which are the SS Members uses the messenger in Facebook to interact with the chatbot.

One Time Password (OTP). Online security measures are important to safeguarding your system. Most banks and retailers adopt OTP (One Time Password) or TAC (Type Allocation Code) via Bulk SMS to secure your online transaction. An SMS consist of random code will be delivered to user who just performed an online transaction. [8] This will be appropriate for the chatbot because this will become the key for the authenticity of the member to access their records.

D. System Design

a. System Features

Accessible. Whether in Desktop or Mobile version of Facebook. Information asked by members are equally catered anytime, anywhere.

Two-factor Authentication. This is where One-Time Password (OTP) comes in to play. The OTP will be sent on the mobile number designated by member to SSS to access features of SSS-MPICS.

Personalized for SSS Member's Use. Answers SSS-related inquiries of Members on the requirements or status of their benefit or loans.

b. Database Design

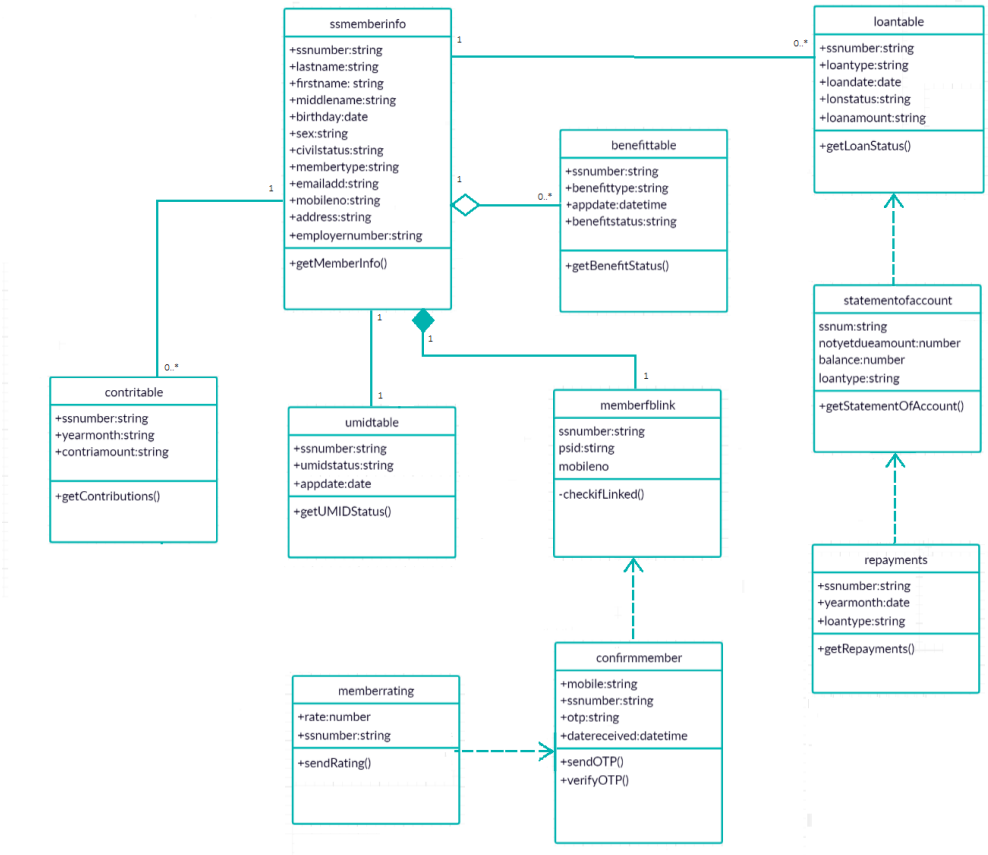

Fig 3.2 – Class Diagram of SSS-MPICS

E. Implementation

To implement SSS-MPICS, the interaction of the chatbot was derived from the mockups that was created during the proposal document and was coded using Node JS. The first group of Node JS codes (webhook) was for the communication of Facebook to Dialogflow. Another Node JS file was created for the interaction between the Dialogflow, to Twilio and the database (MySQL). The two sets of Node JS files were executed in the command prompt of the webhook server. The link needed by Dialogflow for Fulfillment (webhook) and Facebook was generated by Ngrok running on the webhook server. For User Acceptance Testing, Node Js programs were uploaded in Heroku with an addon ClearDB for MySQL.

Chapter IV

PROJECT ASSESSMENT

A. User Testing

The logic of SSS-MPICS in Node JS and MySQL database placed in Heroku, the proponent asks some people to use the chatbot.

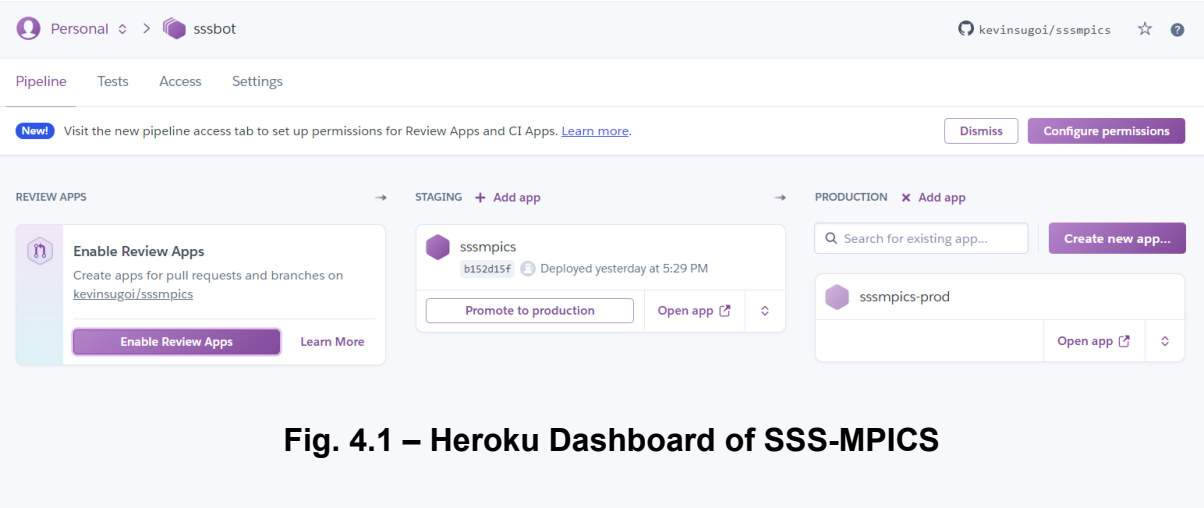

Fig. 4.1 – Heroku Dashboard of SSS-MPICS

Testing was done in different transactions to see that every part of the system works with multiple users. Due to the data privacy law, data used were dummy data and assigned to users used their own mobile device and their Facebook messenger. The proponent encountered a bug when testing it with built-in code editor of Dialogflow. It is only good for a one-time compiling and the codes were written differently than the external webhook. The simple solution was to jump already to the external webhook.

B. Testing Results

Below are the testing results done in Webhook and Database setup in Heroku production. The user acceptance test determined the precision of chatbot's response per scenario.

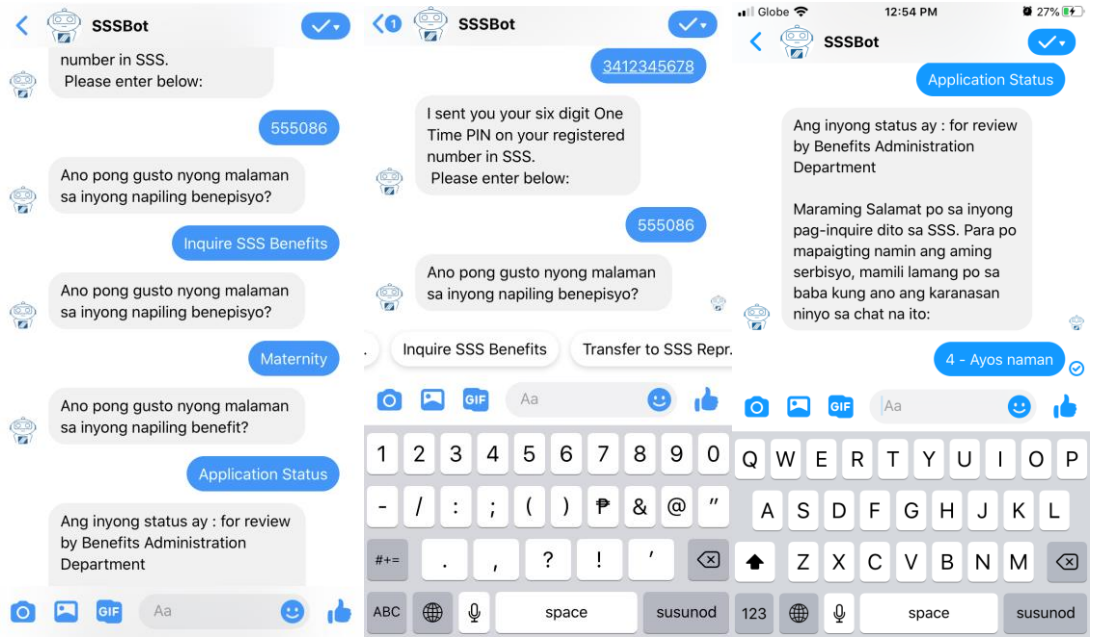

Fig. 4.2 – SSS Bot testing results on Heroku

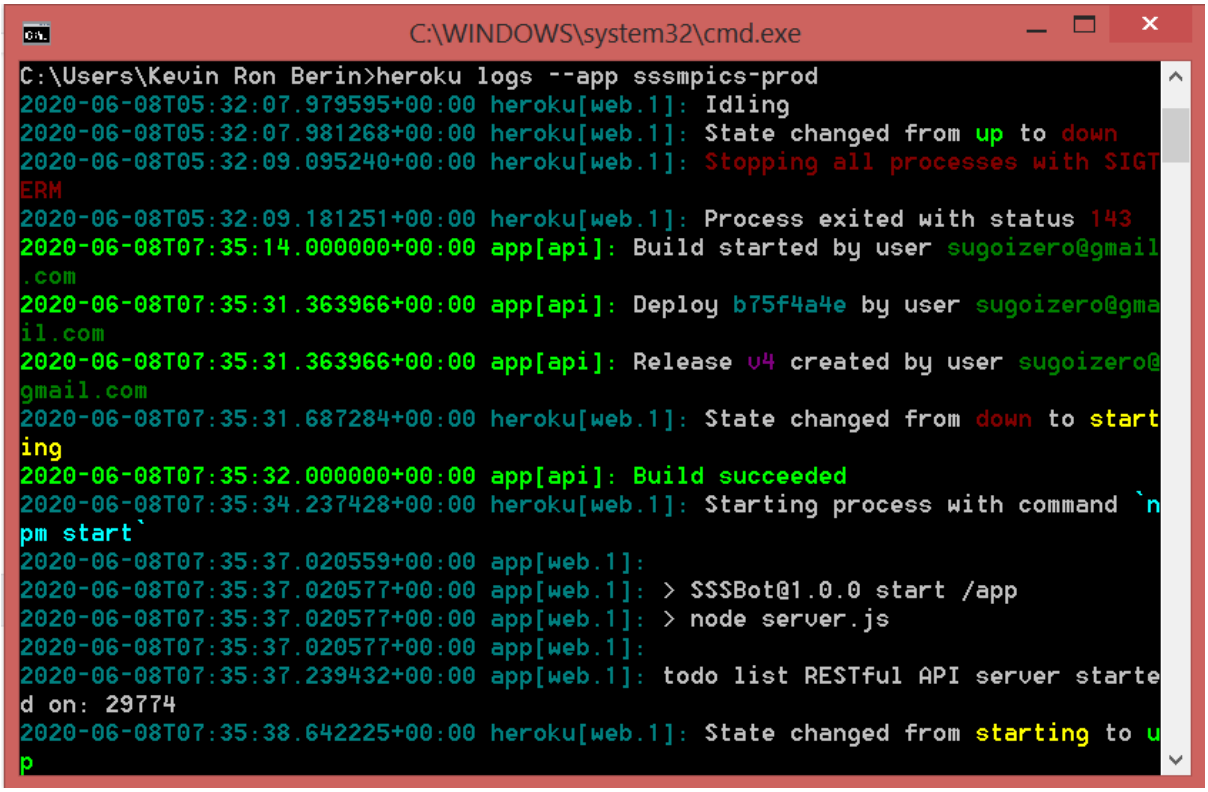

Fig. 4.3 – SSSMPICS logs for monitoring

Due to the quick replies feature of SSS-MPICS, the users were quite amazed that they need only to tap the option they want and the chatbot responds. Some prefer the talk to representative option due to their complex understanding of what they want to accomplish but simpler when done on the chatbot menus. For the overall results from data that were collated, mostly it has positive feedback. Therefore, the system is widely accepted by the users.

Chapter V

DISCUSSIONS

The proponent learned to do server scripting programming particularly in Node JS. Node JS programming helped the proponent to create custom web services (Application Programming Interface or API) that is being called by various applications. Another is the concept of Java Script Obejct Notation (JSON) format. JSON is the data transmitted to and from the API. The Facebook, Dialogflow and Twilio API json components. It is a must that you know how the data is set in each API to be able to access and do functions.

The challenge the proponent encountered was the One-Time Password. The first is the generation of OTP. The solution that the proponent came upon was to program 6-digit random number from 0-9 then sent it to the Twilio API. the Another functionality of OTP that the proponent had the hard time was the matching of the OTP sent to member and the 5-minute validity. What the proponent did was to create a table to store the generated OTP and the date and time it was saved. When the member received their OTP and entered it into the messenger, the program reads not only the OTP, also the time when it was sent then compared it to a program then compare it to the one that was saved when the OTP was generated.

Resourcefulness is really a must-have attitude so when someone create something and it does not behave the desired way, you can look for alternative ways considering that it will be efficient and behaves the same result.

For the continuity of the system, the system is placed at the Hosting Services Department (HSD) under the Information Technology Management Group (ITMG). There are people that monitor the behavior of the systems 24/7 with shifting schedules so if something happened to the system, they are on the response. With them on the lookout, the notification of the developer/s of the Information Systems Division (ISD) will be a standard operating procedure. The division has implemented a scrum methodology so when the work at the system, it will be on the next sprint.

Chapter VI

CONCLUSION

Chabot nowadays is a great relief for businesses or organizations to reach out to the consumers. SSS has leveraged the capability to answer most of the most asked questions by the creation of Social Security System – Member Personalized Inquiry Chatbot System (SSS-MPICS). The chatbot is now a helper responsible for information dissemination to members whether they are the 2.5 million members that follow the official page of SSS or not.

All the required things for the study to be successful worked together as intended. The integration of different platforms, Dialogflow, Twilio and Facebook Messenger effectively produced a new way for members to communicate with SSS. The systems objective to be less expensive compared to the existing alternatives is achieved.

The intent of the proponent to helped SSS relieve the overwhelming inquiries by the created chatbot was fulfilled. With the effectivity of the system, the employees in the Member Communication and Assistance Department were lifted a heavy burden on their job. The result of this leads to a productive but with more time to spare rather than taking overtimes. The time they have can be used to a more productive activities not only in the organization but with their personal lives as well.

Chapter VII

FUTURE WORK

There are different things have been left for the future due to continuous offers of SSS services. Future work concerns deeper analysis of implementations and trends of the future possible benefits, loans and contributions that must be adapted by the system to cope up. When that happens, the need to upgrade the current system is necessary.

A language selection like customer service through phone before proceeding to the inquiry proper will be also a future idea. For the chatbot to cater more members especially in the other parts of the Philippines with different dialects and for Filipinos overseas.

Another is the chatbot industry is relatively new, especially in the Philippines. More features can be made for the optimization of the services and to achieve the human-like interaction with the consumer. So, adaptability can be made with the future chatbots.

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APPENDICES

A. Deliverables and Milestones

Below is the table of timeline of deliverables and milestones in creating the chatbot:

	May 2, 2020	May 11, 2020	May 11, 2020	May 11, 2020
Implementation Document	Deadline of submission			
Prototype		Presentation		
User testing and assessment plans			Presentation of the prototype	
Report of results from user testing and project assessment				
Suggestions for revisions of the prototype			Receive of suggestions for enhancement and revisions	Testing of next version

B. Budget

The proponent assessed the resources that was paid. The SMS for One-Time PIN facility Twilio in their volume discounts ranges from $0.0075 or 0.38 pesos per message for 5 million messages per month and more volume, more discount per message up to $0.0005 or 0.025 pesos per message above 1 billion messages. For presentation purposes, the proponent will choose the Pay-as-you-go SMS pricing fixed rate of $0.0075 or 0.38 pesos per message. [12]

C. Qualifications

The proponent has knowledge on creating conversational flow for chatbot any know bot engine will do - Dialogflow. Another skill was the integration of programming to call the data needed from SSS database through a webservice (API) webhook made with Node JS. Displayed records in chat will come from MySQL. And the knowledge of short message web service for as One-Time PIN facility using Twilio.[8]

D. Contributors / Collaborators

One of the major collaborators in this project is MCAD that allowed the proponent to create the project and measure its impact in SSS. Their information in a form of reports made clear of the objectives of the proponent in this project.

E. Resources

The link for the study's source code can be located at this repository made with Node JS:

https://github.com/kevinsugoi/sssmpics