3.1 Gaps/ opportunity identified in ICT department.

3.1.2 Abstract.

Being a computer student one of the must have skill is the problem solving skills. In every IT environment there are tonnes of opportunities to innovate. Solving or automating small task or even real world solution is for the greater good for the organization or the community.

Today everything is changing and leaning on the technology. A sad truth is we can't do or be more productive without the help of technology. Optimizing work by using different technology have made our life easier and more productive.

Current all organization must have a ICT department whose primary function is user management, IT help desk and managing organization network and data centers. Staff within the organization must be up to date with the current technology.

KENGEN ICT department is fundamental for the smooth operation within the environment. Its basic functions is to manage the users by use of active directory, manage the LAN of the workstation and provide support to electrical automation department.

Working with the department unlocked some opportunities as there are a lot of repetitive tasks and some does not require a lot of expertise such as slow working of the computer as one of the solution is restart the computer and it can be done by the user. This kind of tasks is consuming and requires a lot of movements. Optimizing this kind of task will be fundamental to the department as they cannot waste a lot of time solving things that a user can solve on his/her own.

3.1.3 Background

Working with the department for the last 12 weeks I identified an opportunity. This problem identified is to automate IT helpdesk by use of a chatbot. There are a lot of repetitive task within the workstation that does not require expertise. Some are ; slow working of the computer, login in to the domain.

A chatbot is an artificial intelligence program and a Human–computer Interaction (HCI) model (Bansal & Khan, 2018). According to the dictionary, a chatbot is "A computer program designed to simulate conversation with human users, especially over the Internet" (*Chatbot |Definition of chatbot in English by Lexico Dictionaries*, 2019). It uses Natural Language Processing (NLP) and sentiment analysis to communicate in human language by text or oral speech with humans or other chatbots (Khanna et al., 2015). Artificial conversation entities, interactive agents, smart bots, and digital assistants are also known as chatbots.

Chatbots are more friendly and attractive to users than, for example, the static content search in frequently asked questions (FAQs) lists. They offer users comfortable and efficient assistance when communicating with them; they provide them with more engaging answers, directly responding to their problems (Brandtzaeg & Følstad, 2017) (R. Ranoliya et al., 2017).

Chatbot will be fundamental to the organization as it will increase the productivity, the work load of the relevant department will be greatly reduce and the cost of operation will be lowered. This chatbot can also be integrated to the active directory domain to solve some of the repetitive tasks such as changing passwords.

3.2.1 Problem statement.

With the evolution of the technology towards the age of artificial intelligence has forced many organization to adopt fast to it. This evolution has come with a lot of opportunities and has proven productive.

The focus of this opportunity is to automate the repetitive tasks attached to the ICT department by using a chatbot.

3.3 Main objective.

The main objective for the study is to increase the productivity and reduce the workload of the department.

3.3.1 Objectives.

1. To reduce the operation cost for the department.
2. To develop a system where users are able to learn basics about the computer environment.
3. To enhance the workflow of the station.

3.4 Scope

An intelligent and user friendly system that will solve most of the frequently asked questions. This system can be customized to suit the needs of the department and also other departments can apply the system.

3.5 Significance

My aim of developing this system it primary function was to solve the repetitive and mostly asked question but also it can be a powerful tool for the staff as they will solve most of the non-technical task thus improving their understanding on how computer works.

4.1 System design and implementation.

The chatbot is an end to end meaning it can handle a conversation from start to finish without requiring human assistance.   Creating an end-to-end Chatbot involves collecting data, choosing a programming language and NLP tools, training the chatbot, and testing and refining it before making it available to users.

The flow of conversation:
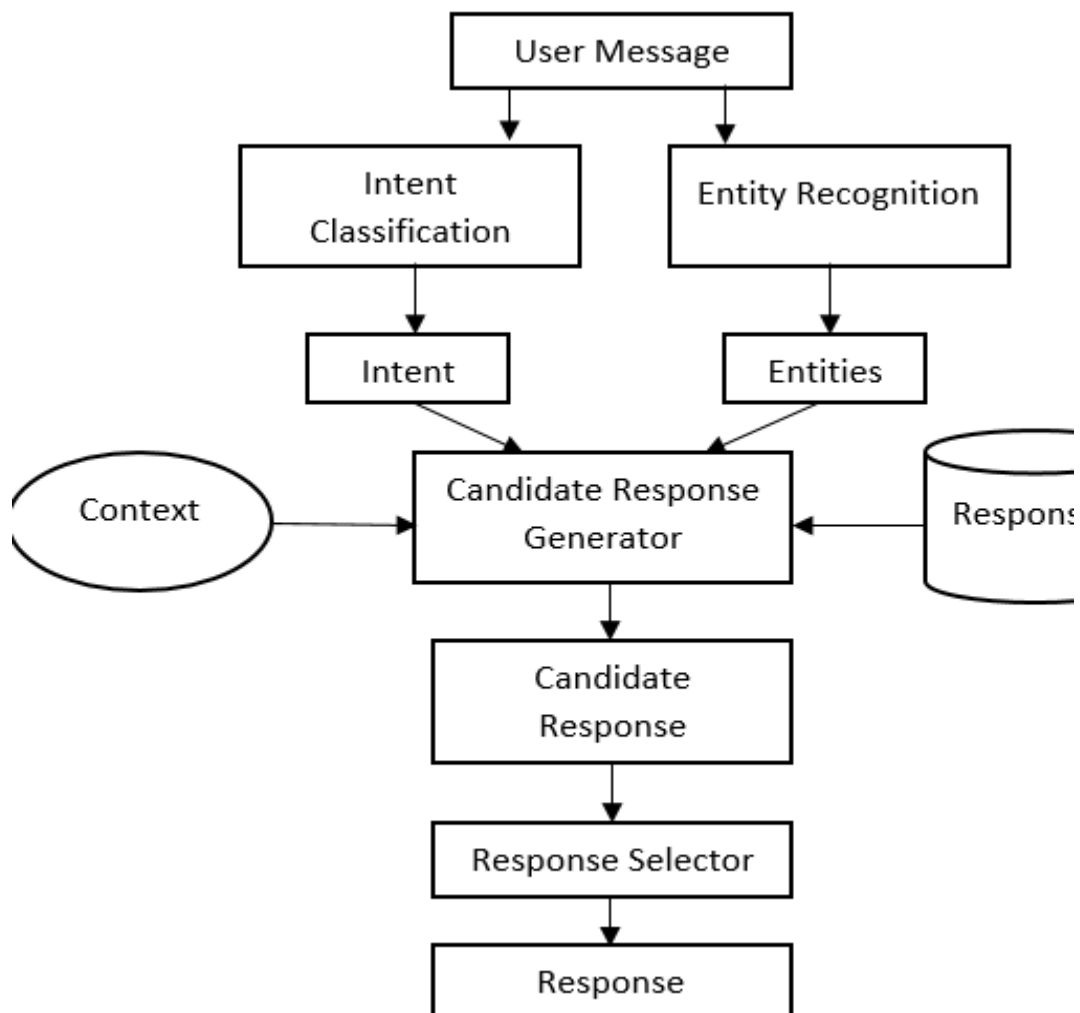
4.1.1 Methodology and tools used.

For the system to fulfil its objectives there has to be a methodology of the system development. I use waterfall project methodology. This is a sequential development process that flows like a waterfall through all phases of a project (analysis, design, development, and testing, for example), with each phase completely wrapping up before the next phase begins.
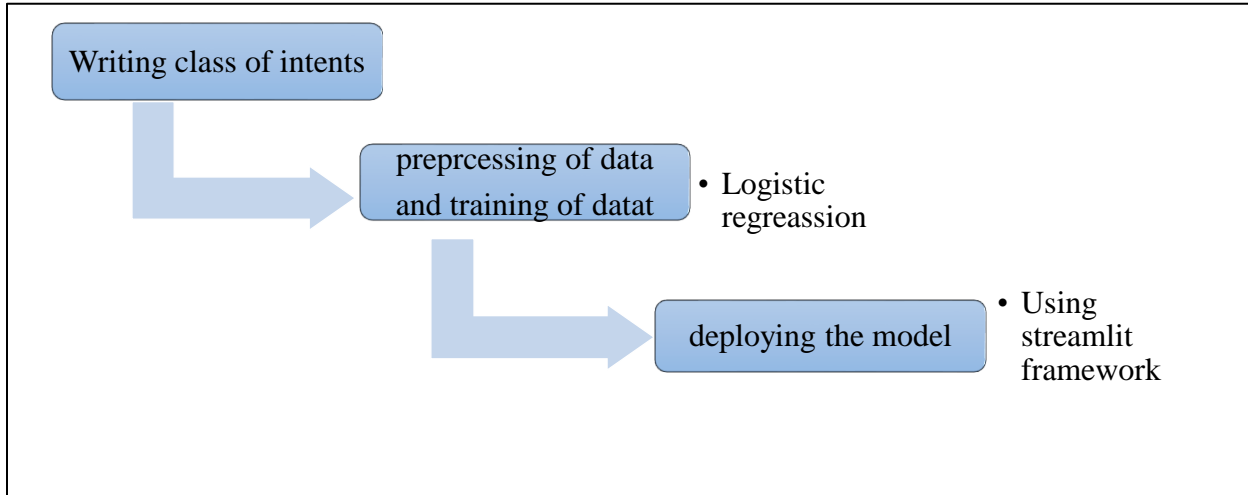
The tools I used for this system are:

Natural language processing tool kit to provide supports classification, tokenization, stemming, tagging, parsing and semantic reasoning functionalities. Natural Language Processing, also known as NLP, is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to fruitfully process large amounts of natural language data. NLP enables the computer to acquire meaning from inputs given by users. It is a branch of informatics, mathematical linguistics, machine learning, and artificial intelligence.

Working of an NLP Chatbot:

1. For example, you want to purchase something, and you decide to use a chatbot. You type in your request.
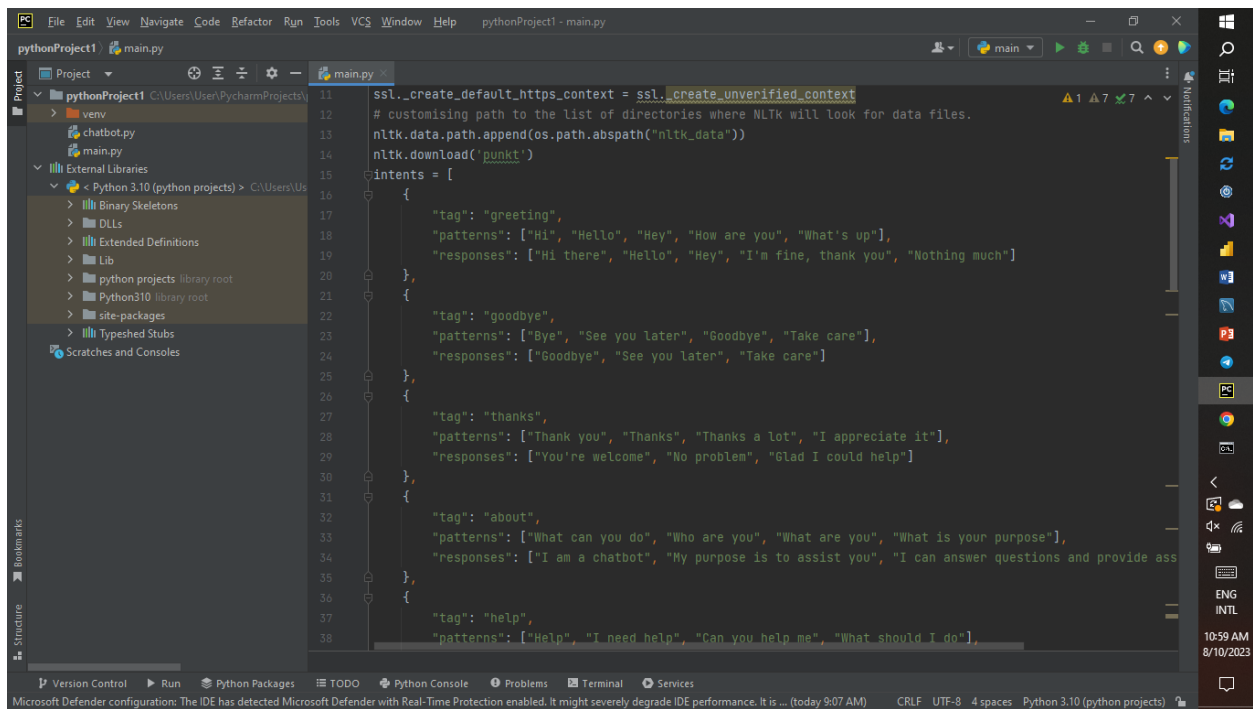
2. When you send a message to the chatbot, asking for support, the chatbot sends the plain text to the NLP engine.

3. At the NLP engine, the unstructured human language is converted to structured data that the computer can interpret. Thus, it uses algorithms to get meaning and context from every sentence to collect data from them. This process is called **Natural Language Understanding (NLU)**.

4. The chatbot moves the data that was collected (the intents and entities) to the decision-making engine.

5. The decision-making model derives a solid decision based on previous actions and results taken.

6. Then at the Natural language generator, the chatbot converts the decision data to text. This process is called **Natural Language Generation (NLG)**. Using NLG, the message generator outputs the message. This message is displayed to the user in the form of a text or voice message.

- **Secure Socket Layer (SSL)** to encrypt data in transit and authenticate websites identities making them a vital tool in keeping online transactions safe from cyber threats. This security protocol creates an encrypted link between a web server and a web browser.
- **Streamlit framework** for creating a web application. This open source software is easy to use by providing tools that make it easy to create an interactive websites. It allows for the creation of websites to view data, run machine learning models and accept user input without the need tp write HTML, CSS and Javascript codes.
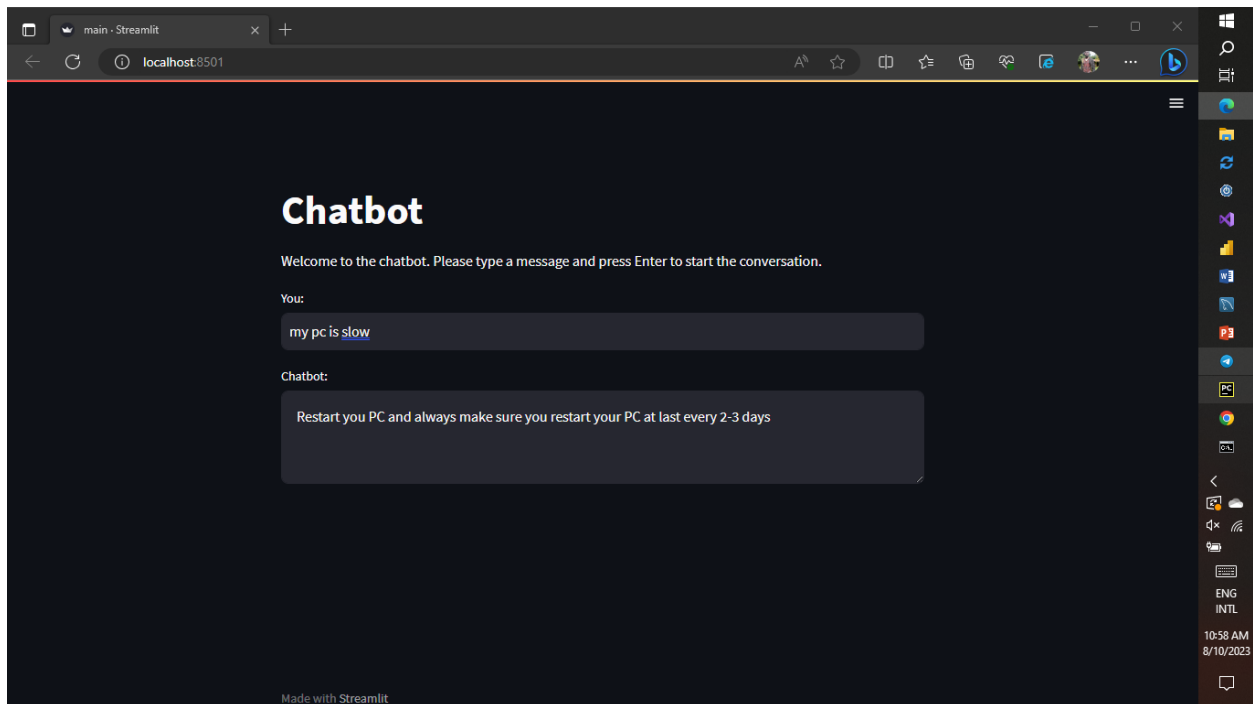
4.2 Results and experimentation.

Libraries used:

Intents are divided into classes and each class has tags, patterns and responses:

After running the above program this is the results.

The above program/system performed greatly after testing it with different tags. This chatbot can be further customized in terms of intents to fit users needs.

It can also be integrated to whatsapp, facebook or telegram by using appropriate API and also databases.

4.2.1 Functional requirements.

Channel: This chatbot will be integrated to the mostly used messaging application my proposal is whatsapp, reason being recently every one prefer communicating using whatsapp other than other means, based on statistics whatsapp is one of the mostly used application in Kenya.

Intent recognition: Recognize the intent behind user messages to determine the user's goal or purpose. Route the conversation based on identified intents.

User interaction: The chatbot is be able to engage in natural language conversations with users. It should understand and respond appropriately to user inputs and queries.

NLP Processing: The chatbot mplemented NLP techniques to tokenize, parse and understand user messages. Perform named entity recognition (NER) to identify entities like names. Utilize part-of-speech tagging for analyzing sentence structures.

Data Privacy and Security: Handle user data and conversation securely and in compliance with data protection regulations and implement encryption and access controls as needed.

Summary.

Chatbots are has proven to the then next big venture in the current technology. It can solve most of the task that does not require a lot of resources and also it does not require a lot of resources. ICT department are now able to focus other technical aspects.