Comparative Review of AI Self-Aided Assistant Applications

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Abstract

There has been an increasing excitement in the development of Conversational Agents (CA) commonly known as "Chatbot", "Chatterbot", "Talkagent", "Smart Agent" and many other similar terms. From its inception in the 1950 with the ELIZA, computing giants such as Apple, Amazon, IBM have developed different CAs such as Siri, Alexa, and Watson Assistant. These self-aided AI powered applications has influenced human-computer interaction, and the demand is on the rise, and so is the technology. The large availability of these applications makes it difficult for prospective users to decide which is most appropriate considering their objectives. The research reviewed selected chatbot applications with the capability of creating customized and customer oriented chatbot. Using the explorative methodology, the research systematically identified the features, strengths, weaknesses, and made recommendation.

1. Introduction

Text and speech are the most powerful forms through which human communicate with the computer. Hence researchers are in search of ways to better improve the Human Robot Interaction (Kang, 2018) (HRI) because human existence is increasingly dependent on these interactions (Athreye, Ngono & Usbeek, 2018). Every aspect of human life is influence or possibly controlled by how effective we are able to interact with machines. From cash withdrawer at the cash point to booking and traveling, our next appointment with the doctor, servicing of car, purchasing, prompt customer service, all relies on a computer program (Khanna, 2015) called chatbot. This has necessitated the rapid rise of the AI based machine.

Chatbot is a computer system that allows human to interact with computer using natural language. It is an application engine designed to provide appropriate human like responses based on natural language processing technique (Abdul-Kader & Woods, 2015). It is a computer program that has the ability to hold a conversation with human.

Chatbot also known as "chatterbot" or "chatter robots" is the form of messaging app via text or speech. It can understand multiple question requested by human.

Historically, Chatbot which was referred to as "ELIZA" (Lioa et al, 2018) has been around in the 1950s and early 1960s which was designed using a pattern matching approach. This development further inspired the Artificial Linguistic Internet Computer Entity (ALICE) which is implemented using the Artificial Intelligence Markup Language (AIML) (Lioa et al, 2018).

Chatbot has been widely implemented in various fields due to its flexibility (Ahmad, Hafizche, Zainal, Rauf & Adnan, 2018) and interoperability. It is used in education as a tutor, marketing, health care, customer care, computing and etc. It is a useful tool for adhering to health promotion intervention, giving support, and analyzing natural language. It helps human with real time update data. The large availability of artificial intelligent based self-aided applications in the market makes it difficult for a new comer to make a choice of the most appropriate one. To ease this problem, the researcher finds it necessary to make a review of the commonly used applications – identifying the strengths and weaknesses of the selected applications.

The aim of the research was to compare the major artificial intelligent self-aided assistants and the objectives of this research were to;

    i.   identify AI self-aided assistant applications;
    ii.   ascertain the unique features of AI self-aided assistant application;
    iii.   compare and contrast the AI self-aided assistant applications;
    iv.   recommend the effective AI self-aided assistant application.

This research covers the review of common self-aided AI based applications such as;

    i.   FlowXO
    ii.   IBM Watson Assistant
    iii.   Google DialogFlow
    iv.   Rasa
    v.   Azure

Which are used for designing or creating chatbots for different usage. Comparative analysis were based on;

    i.   The algorithm that was used in the implementation
    ii.   The environment assessment
    iii.   Usability
    iv.   Cost implication

2. Review of Related Literature

The advancement of the IoT, big data and mobile computing has led to the provision of smart services. The information technology paradigm has shift to smart environment, as ubiquitous technologies thrives successfully on the wings of Artificial Intelligent (Machine Learning and Deep Learning).

Smart services by definition are services that are capable of actively adapting and responding based on context or circumstance of interest – a context aware connected services (Dinh, et al. 2021).

The generic name or applications associated with the provision of such services are termed as chatbot which are usually powered by components of AI.

In recent years, every industry and sector have experienced different levels smart service which is basically a self-aided service using various types of chatbots. The fashion industry for instance made giant strides after the 2020 COVID era. In the work of Landim (2022), it was noted that chatbot was been used to determine consumers' acceptance, forecasting and production management. The work states that chatbot provided personalized shopping experiences across physical and online channels.

Silva and Alparone (2020) highlighted the use of chatbot in food delivery and the rapid moving away of app and website based ordering. The utilization or adoption of innovative technology such as the touchpoint chatbot provides the intermediary service that is able to provide "whaterver, whenever, wherever they want to eat" possible.

The development and use of intelligent tutoring system in the teaching-learning process is believed to have certain level teaching wisdom, a large knowledge based established according to teaching goals and a home tutoring system to track and diagnose students' learning status based on learning condition (Yuan, Li, and Peng 2021).. The work simulated the use of chatbot (LINE) as a learning tool and noticed a remarkable level of participation from the learners.

Huang and Kao (2021) work demonstrated the use of conversational chatbot in providing virtual customer service as an additional layer of support to customer services by making personalized services available to customers anytime and anywhere. This proved to be effective and increased the visit rate.

Asquer and Krachkovskaye (2022) presented a work that established the use of chatbot for case study presentation as against the provision of problem scenario features. It showed that students the later did not stimulate students' skills to actively search for relevant information.

In all, the benefits and relevance of chatbot, smart robot or application is evident in every industry.

Generally, chatbot can be distinctively categorized into commercial and social chatbot. A commercial chatbot focuses on customer service. It is typically designed for customers or marketing services, developed to assist customers with specific questions within a specific domain (Croes et al 2022).

Social chat is mainly for the provision of social interaction and it is characterized by social intelligence, emotional intelligence and conversational intelligence (Chaves and Gerosa, 2020).

3. Review of Specific AI self-aided Applications

Chatbots are viewed as natural user interfaces as such when designing and adopting chatbots, customers (retailers) prefers platforms that will enable them to design their own or consult a third party to design chatbot according to their specifics. Majorly, retailers wants chatbot to successfully mimic natural language and also analyse skills that aids business decision.

3.1   Flow XO

Flow XO is an online AI chatbot development platform. It is simple and easy to use. It starts with a simple registration process, email authentication (verification), and you are good to go.

It starts with you creating your bot, and linking it any of the integrated or support media such as Facebook Messenger, Slack, YouTube and others.
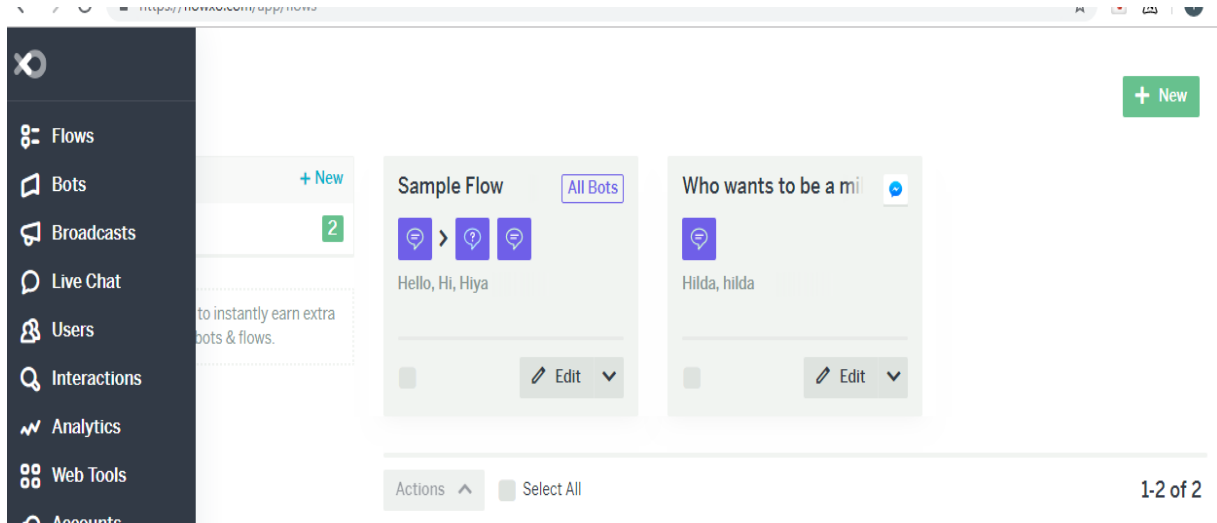

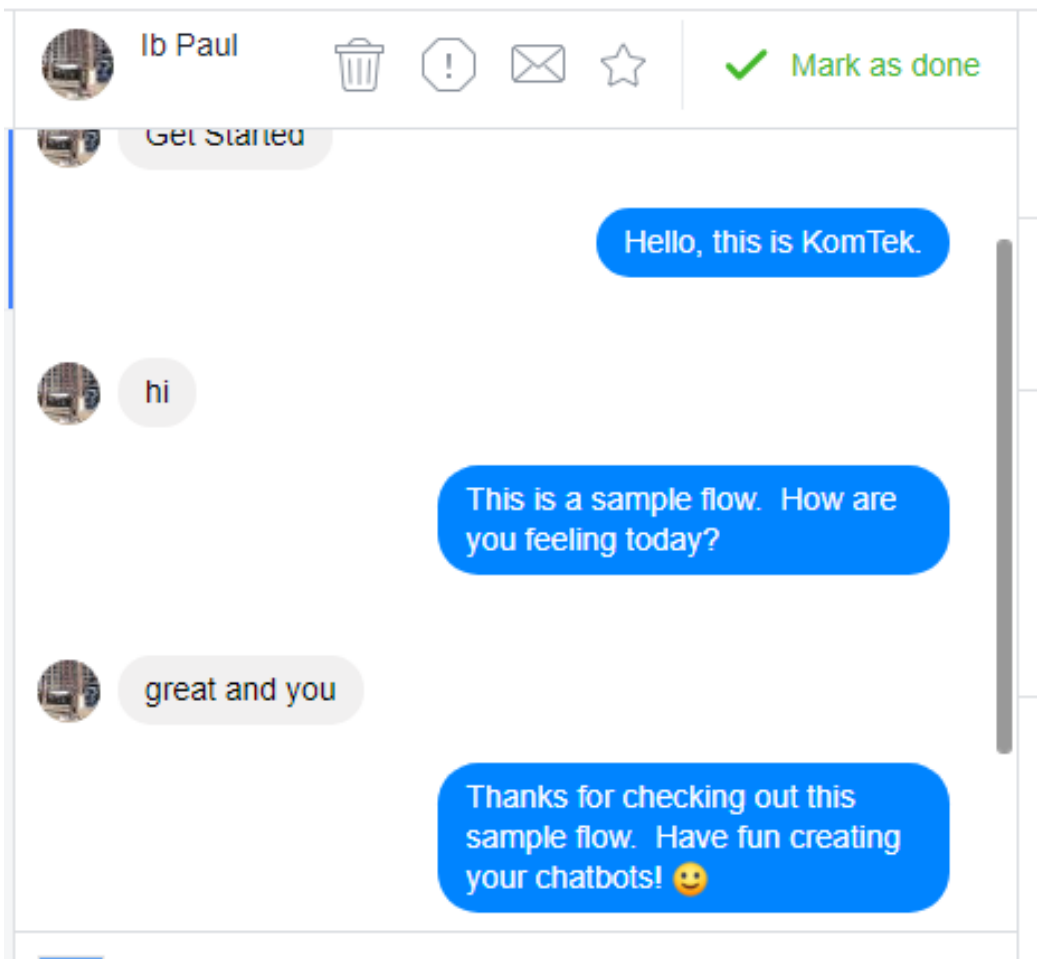*Figure 3.1: Screenshot displaying a Flow in FlowXO*

Figure 3.2: Screenshot of newly created and published bot (chatbot) on FBMessenger using FlowXO

In figure 3.2, the name of my bot is KomTek, and it is showing the conversation between the human and the bot (KomTek). You are at liberty to give any name to your bot.

In order to effectively use the bot you have created, you start by creating flows – the things you want your bot to do. It is like giving skills to your bot. You determine the capability of your bot in the flow. Please feel free to try it out, make your mistakes and own a bot.

3.2   IBM Watson Assistant

The IBM Watson Assistant is more complex than the Flow XO, however, it has lots of customization ability, giving the developer a relatively free hand to be creative. In this report, I implemented the transcript "Who Wants to be a millionaire" using Watson.
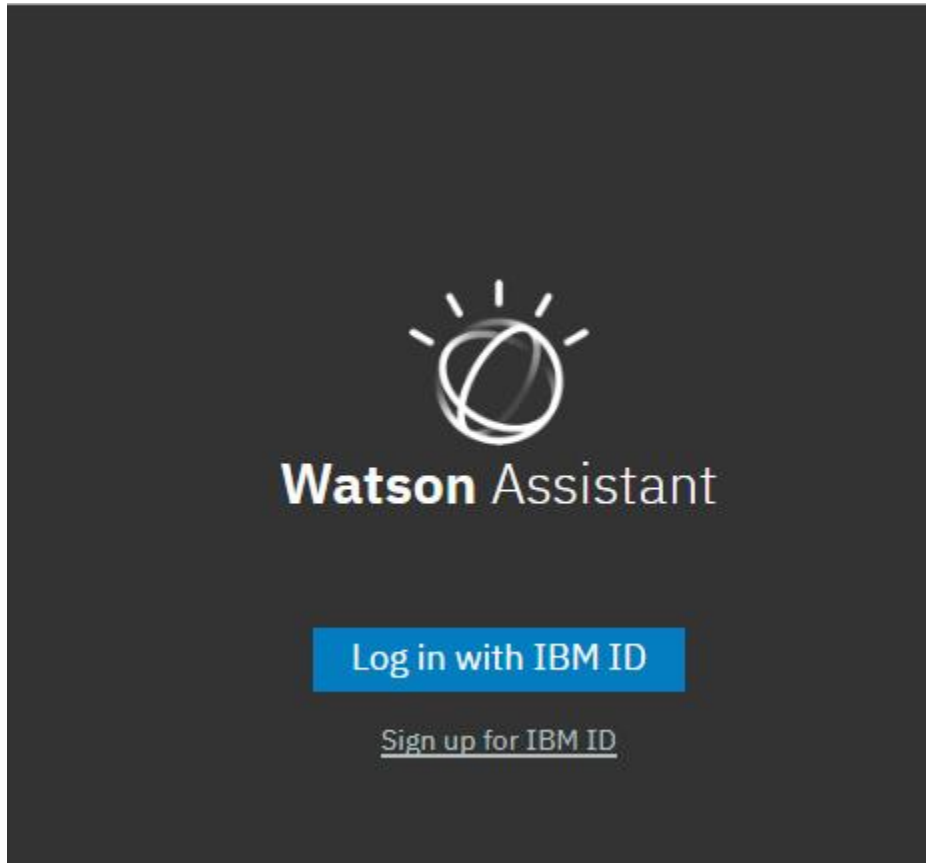
Figure 3.3: login screenshot

Source:
https://idaas.iam.ibm.com/idaas/mtfim/sps/authsvc?PolicyId=urn:ibm:security:authentication:asf:basicldapuser

Figure 3.3 is the login screen, click on sign up if you do not have login details yet. On successful login, you have select a plan – the lite which is subscription free. Just in case you are not sure, if you search for IBM cloud, you can navigate your way through to Watson Assistant.

The home page gives you 5-8 minutes video tutorials that will kick start you on your journey.

Now that you have gone through the tutorials, you start by creating a skill. Now this is same as flow in Flow XO. You are defining what the assistant will do.

Using an outline, a skill was created with seven intents. The intents represent the questions the user will ask. Simplify it by giving it titles that defines the content of the question. For example, for an intent called Prose, the question is about the author of Animal Farm. It is also within the intent that you frame the question in the most possible ways the user is likely to ask.
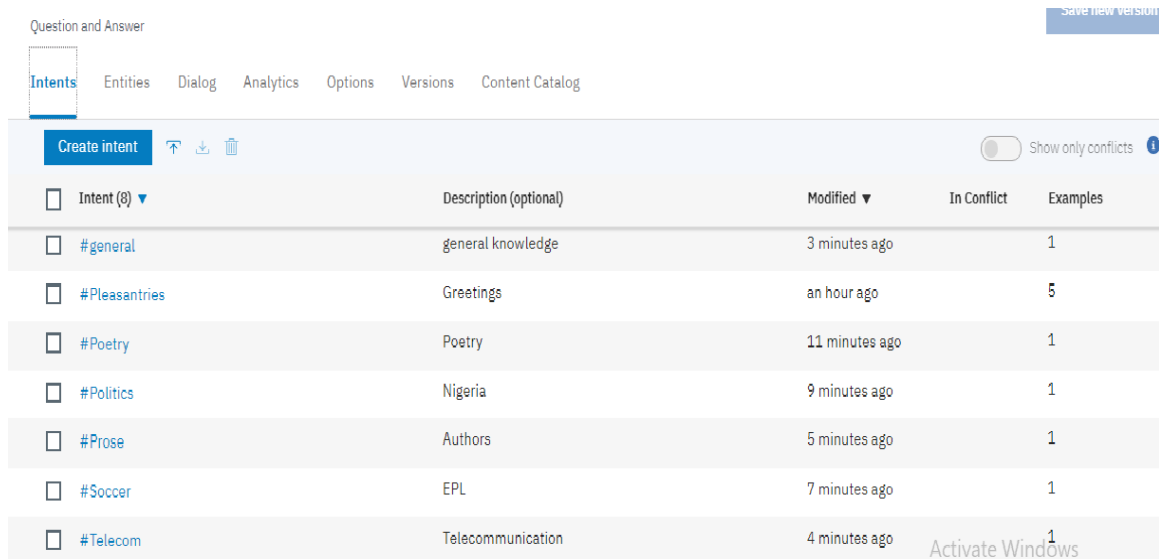
Figure 3.4: Screenshot on creating an intent

On clicking on the prose, you will list the possible ways in which a user may ask the question.
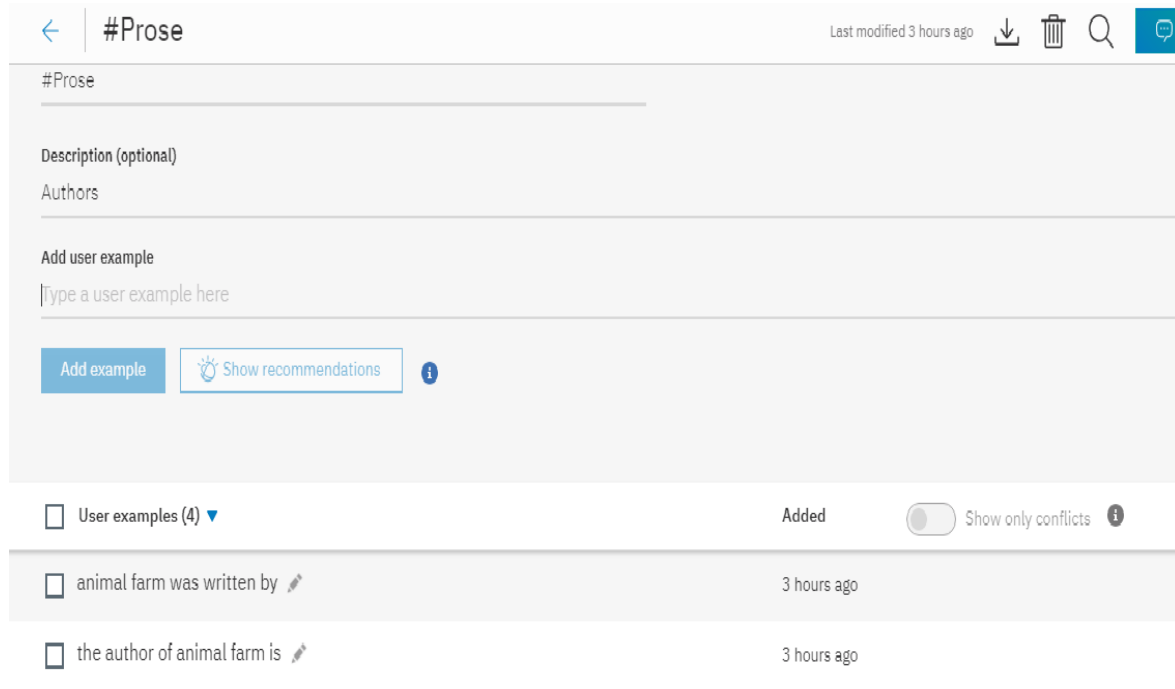

Fig 3.5: Screenshot to list possible alternatives for an intent

This is very crucial as it will be the bases for the pattern matching following the chatbot the data structure model process earlier discussed.

From the intent, you can create entities. Entities comes handy or become relevant when you may have subs to questions. For instance if you are dealing with locations are you have more than one location, it will be needful to create entities. Also, if there may be different ways of presenting an answer, please use the entity as it gives you room to create word synonyms.
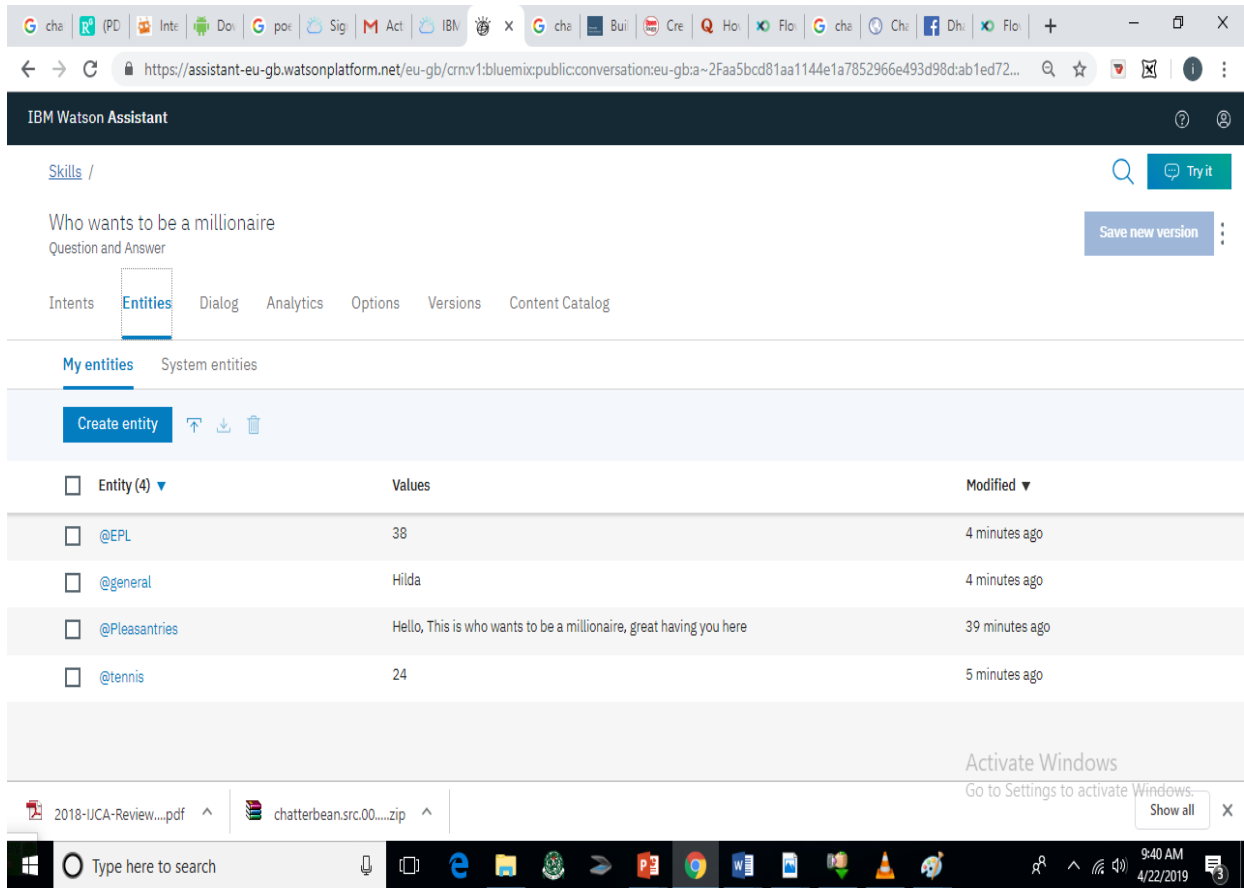

Figure 3.6: The Entity Screenshot for specifics on the intent

The main work is the dialog. This brings together everything that you have created so far. This is the linking element.
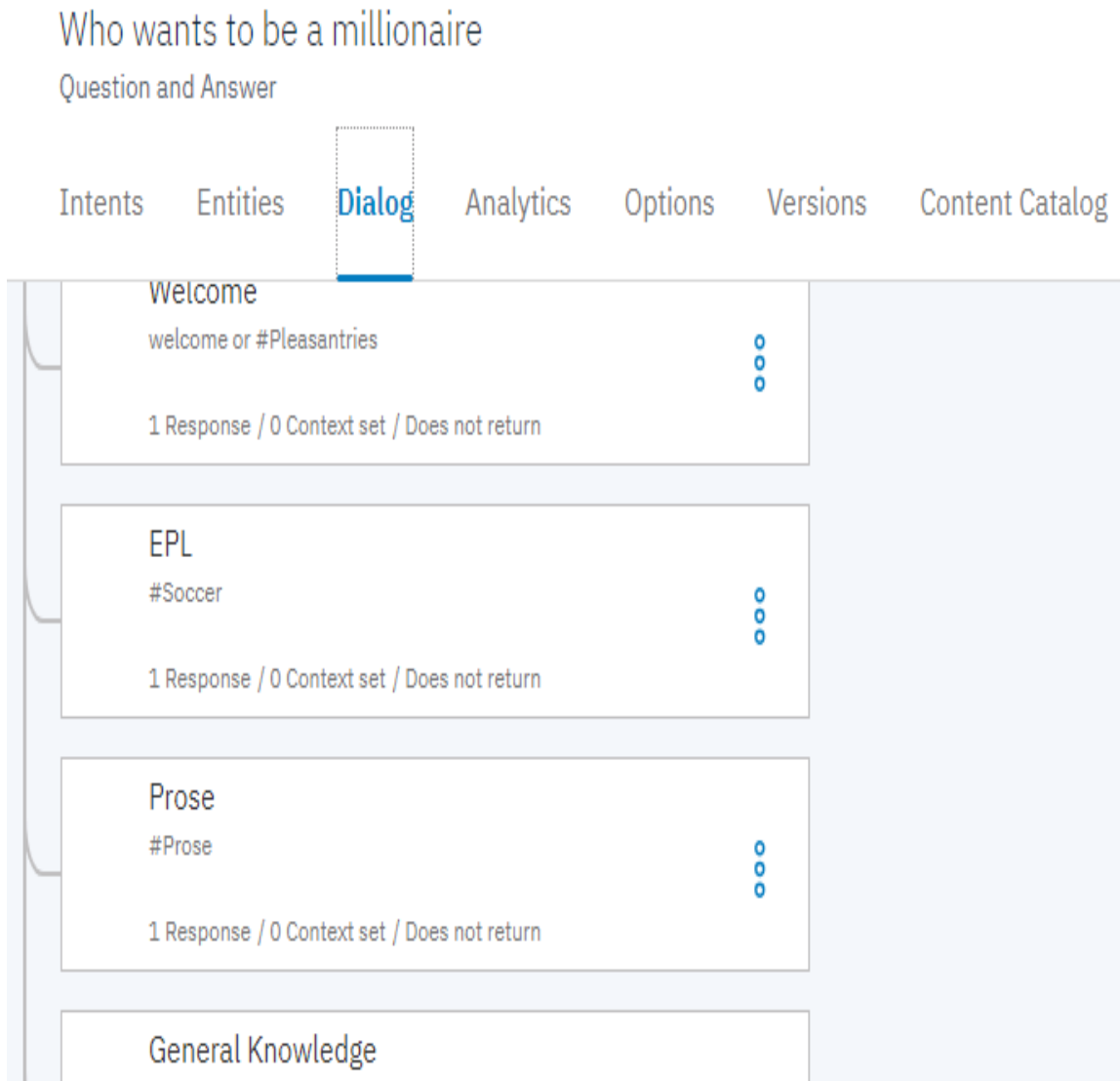
Figure 3.7: The Dialog Screen

The number of dialog you create will be same as the number of intents. In creating the dialog, you can create sub dialogs. However, the main dialog (parent dialog) must be true before the sub (child) dialog can be executed.

If all went well, you will see a screen similar to the figure 3.8.
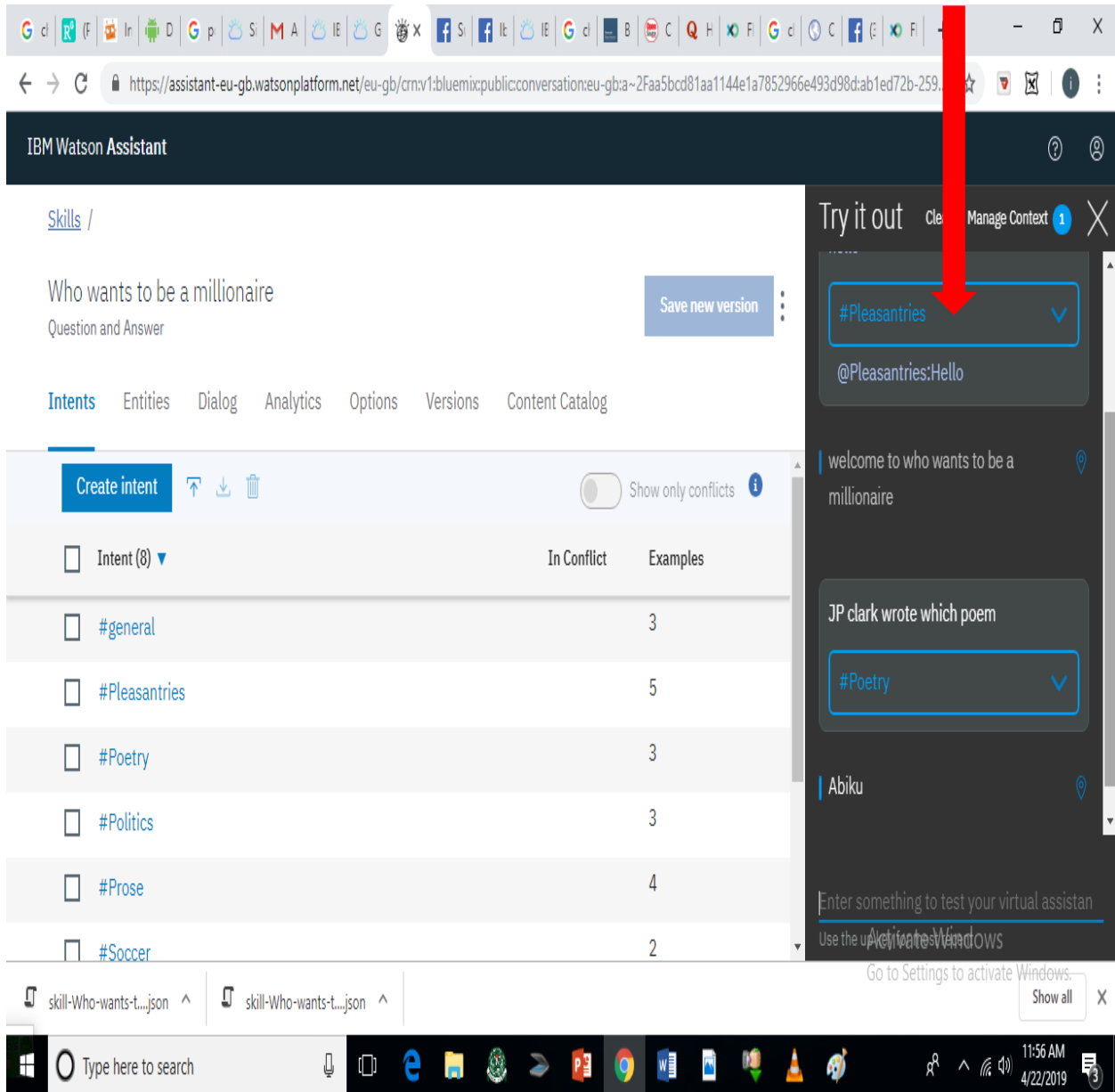
Figure 3.8: chatting with chatbot screen

After you have completed the entire creation process, you can create link or integrate it to any supported social media. This process could be tedious, and requires you registering your new app, making it public by getting a URL etc.

3.3 Google DialogFlow

The most recent version of DialogFlow is known as DialogFlow CX which is a virtual agent that handles concurrent conversation with end users using natural language understanding module. It works by translating text or audio during conversation to structured data understood by apps and services. It functions like a call agent that has been trained to handle conversation scenarios.

Flows are used to define topics and the associative conversational path. Every agent has a default flow from which more flows can be created depending on length of conversation or the topic

A conversation session is represented by pages. This defines the state of the flow – if a session has started or ended. The page is configured to collect information relevant to the conversation from the user

Entity types are used to control how data from end-user input is extracted. There are predefined entities provided by DialogFlow which can be modified or customized to suit stated specification.

Parameters are used to capture and reference values. It forms the basis of the pattern search and matching concept.

For each page, a form can be defined which is a list or collection of parameters,

Intents is the categorization of end-users intention for a conversation. Intents comprises of parameters and trained data. See figure 4.9 for details

Figure 3.9: activity flow. Source https://cloud.google.com/dialogflow/cx/docs/basics
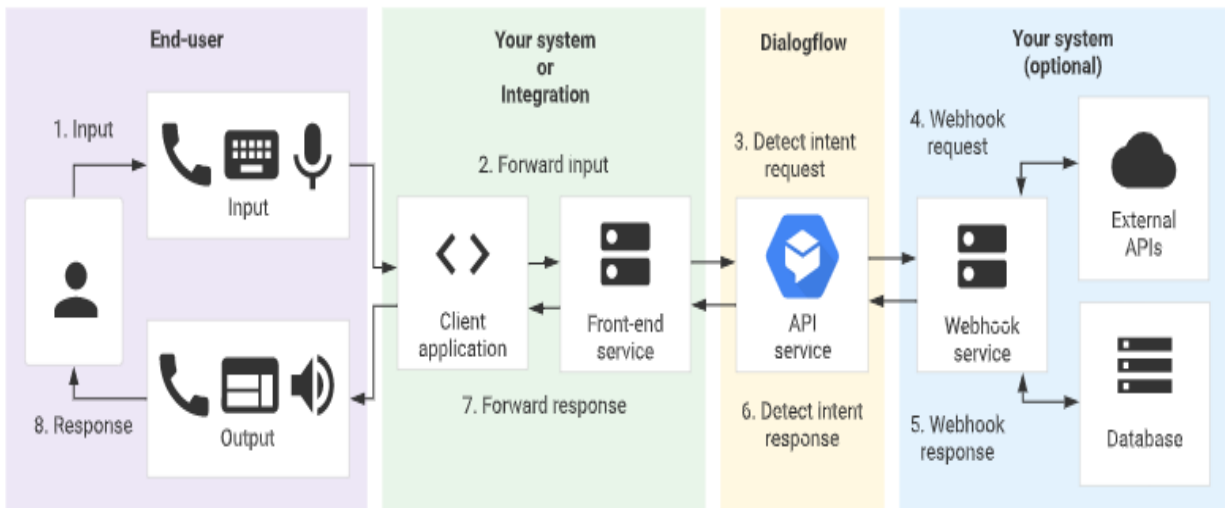
Features includes; the used of advanced AI known as BERT which is based on natural understanding language (NUL), state based data modeling that helps with the reuse of intents, multichannel implementation, simplified virtual flow builder, integration and interaction.

Despite its features, it is pricy and although there is a trial version, it requires debit or credit details updating before you can access the application. Thus it does not allow completely free pre-evaluation prior to procurement.

3.4   Rasa

Rasa is an OpenSource essentially for creating customer experience. It provides tools and infrastructure for building assistants that transform meaningfully our customers interact with business. Features includes; state of the art NLU research, built on opensource, customizable infrastructure, multichannel customer experience, and versatile reusable infrastructure. It is built for scalability

Rasa made provision for free pre-evaluation before purchase, but it requires an authentic business email address during the registration process.

In other to safely guide customers, first timer users have the option of installing a prototype assistant before migrating to the full enterprise edition. Prospective customers have the choice of using the default assistant and customizing to specifications or work with the opensource code to create a unique assistant.

3.5   Azure

Azure is a suite that comprises several services such as Azure virtual machine that support Linux and Windows, Azure SQL Database, Storage, Event Grid, App Services, Functions, Cosmos DB, DevOps, Kubernetes Service, Synapse Analytics, and Cognitive Service. Basically, it can be described as a service oriented ERP.

In as much as it has outstanding features such as cross platform mobile experience, and scalability of workload, it is complex due to the multi service rendering solutions. Just like the Google DialogFlow, it requires verification using credit or debit card. As such, pre-evaluation of Azure is difficult.

Since it is proprietary, it offers different packages ranging from individual solution to multi-layered solution.

4.   Methodology

In order to adequately review the enlisted self-aided applications, the exploratory method was used to explore each AI self-aided application by visiting websites, installation of application, usage of application, and reviewing customers' feedbacks and existing literatures.

The reviews made on the already existing users of AI self-aided applications assisted in the identification of the commonly used applications. It further highlighted the users preferred features and what each self-aided application is been used for.

Using the exploratory method, it was discovered that in other to successfully design a chatbot, the designer should be able to tell what kind of chatbot is required and for what purpose.

Although this work is concerned with the commercial category, the data structure model required for both category of chatbot remains the same as it can be seen in figure 1.

The data structure model of a chatbot is as follows;

Tag: a unique name for each topic that the model covers

Sample Patterns: example of sample query of the topic

Possible Responses: sample responses of the topic after the identification of the topic. One these responses will be randomly chosen as an answer to the query.

Current Context: changes the state/context of the conversation, if needed

Related Context: Helps to filter out the result based on the context set. (Paul et al, 2019)
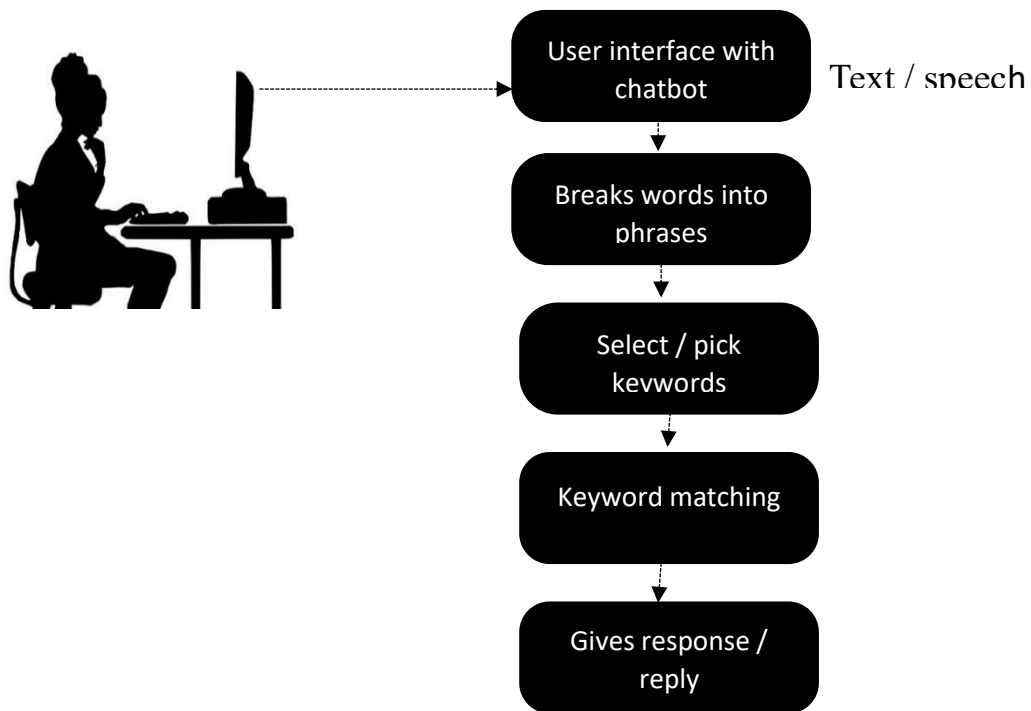

Figure 4: The chatbot communication process

Figure 4 illustrates the working of a chatbot. Firstly, when activated, the chatbot displays a user interface that enables the human to interact with it. The human can input a text or speech depending on the chatbot design.

Secondly, the chatbot takes in the input and chunks the sentences into phrases – a kind of splitting sentences for tagging.

Thirdly, the chatbot picks or select keywords out of the phrases, which are then used for pattern matching – bot logic (Ahmad, Hafizche, et al, 2018). When the pattern matching is complete, it displays the result or sends out a response.

In developing or creating a chatbot, the developer could use any of the following approaches

1. The frameworks or Development platform (IDE)
2. Custom development – modification of chatbot sourcecode.

This work is concerned with the former (the framework or development platform) which requires little or no programming skills

5.1   Discussion

The findings of this research showed that the IBM Watson Assistant and Flow XO are most flexible and cost effective for low budget company as compared to Google DialogFlow, Azure and Rasa. IBM Watson can be installed and assessed prior to business decision making without requiring credit card details. This makes it an easy choice when considering AI self-aided applications. Unlike GoogleFlow, Rasa and Azure, it requires credit card details even though no fund will be deducted. This makes them (Rasa, Azure ad GoogleFlow) challenging to review prior to purchase as the key features and functionalities cannot be pre-tested.

The algorithms used for each of the reviewed self-aided application was not determined as each of them is proprietary. However, depending on the local system specifications, Rasa and FlowXO seems faster when displaying the interfaces and accurately.

GoogleFlow works far more efficient when used or implemented alongside with AWS but on its own, it makes heavy demand on the local system processor and RAM.

5.2   Comparison

Table 5.1: Comparison of Application (Features)

Application	Features	Suitability/ Recommendation
Flow XO	Customization, filter leads, multi-channels, integration, free start up, gathering of information, flexibility	For start-up businesses and businesses with low budgets
IBM Watson Assistant	Owned by IBM, contains simple guided structure, identifiable tools, provision to kick start using the basic, scalable, support advanced machine learning	For start-up, SMEs and large corporation. It services all types of businesses and enterprises

Google DialogFlow	Well detailed tools similar to Flow XO and IBM Watson, it is proprietary, no free pre-evaluation, uses and supports NLU, handles concurrent conversations	Suitable for already established businesses and large corporations. Not suitable for start-up enterprises
Rasa	OpenSource, scalable, customizable, access to source code, comprehensive documentation, multi-channel, reusable infrastructure, support NLU To fully annex its features, programming skills is required	For start-up, SMEs and large corporation. It services all types of businesses and enterprises, even with low budget.
Azure	Multi layered service application, proprietary, scalable, different package, no free pre-evaluation	Suitable for already established businesses and large corporations. Not suitable for start-up enterprises.

Table 5.2: Comparison of Application (Strengths and Weaknesses)

Application	Strengths	Weaknesses
IBM Watson Assistant	i. Easy to deploy ii. Cost free pretest iii. Robustness iv. Availability of online support v. Optional or different affordable plans for purchase	It is mostly text base and requires some level of programming if voice it to be included
FlowXO	i. Easy to deploy and free pretest ii. Adaptability features	Limited customization features
Google DialogFlow	Highly stability and support availability. It is extendable as it can be used along with AWS and other Google Cloud computing applications	Limited customization features and pure proprietary.
Azure	Highly stability and support availability	Limited customization features and pure proprietary.
Rasa	Easy to use and navigate through interfaces.	Limited features which may not meet the customer's requirements

6. Conclusion

The different flavours of Self-aided AI powered applications (chatbot) with different features have created choice for end users. Based on the review, it is obvious that each reviewed applications has its unique features and it is suitable for different scenario and business depending on the stated objectives. While some are cost effective and suitable for start-ups and small enterprises, some are mainly for large corporation due to the cost which is justifiable in the provision of services.

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