Artificial Intelligence for Public Sector: Chatbots as a Customer Service Representative

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Abstract. Many governments began to give customer service a major priority until they became competitive in some of the services provided by its various ministries, global profit companies, in terms of the way and quality of the service provided, depending on the integration of government systems, continuous training for customer service employees, as well as electronic transformation and the use of the latest technologies.

This chapter addresses the technologies used in government service centers, in particular artificial intelligence techniques, and on the feasibility of using the Chatbots and its benefits, how it works best to ensure its effectiveness in providing services, also about the role that can be played in providing its services in light of the Coronavirus pandemic outbreak, finally will try to answer the most important question whether can this technology replace the human customer services representative?

Keywords: Artificial intelligence · Chatbot · Government · Public services · Customer services

1 Introduction

Customers centricity, experience, satisfaction, and excellence were and still hot topics and strategical targets that' organization takes in consideration to maintain the loyalty level in their customers which will insure having a sustainable profits and provide them -the organizations- with an advantage in nowadays highly competitive market (Ahmed et al. 2019).

In the last two decades the profitable organizations were not the only entities whom giving the customer excellence high attention as the governments start provide their citizens with high quality service since the public service level will be reflected in the world happiness report -annual publication of the United Nations Sustainable Development Solutions Network- which affect positively the image of the country economy. And as result of that vision many governments start taking serious step in developing the public services and the way that deliver to their people such as changing the concepts and
terminology that have been used like: beneficiaries, visitors to customers and clients as the public sector look to them with more respect as a value of what they are providing (Hamdan et al. 2019).

Also, many ministries among the worldwide developed a customer care/service centers and call centers which in some cases it’s had been supported with customer experience units that monitor the customers full journey till getting the desired services. Furthermore the E-Governments and electronic services provided by different public entities to facilitate the services have become a priority to those governments whom seeking customer centricity, and with the fast technological growth and in parallel with the fourth industrial revaluation many of these governments start using the AI -Artificial Intelligence- applications to improve Their process and provide fast, smart and easy access services to their customers (Awwad and Zidan 2021).

In this research we will focus on some applications of the artificial intelligence in the public sector customer services and the urgent need of implementation due to current situation with spread of Corona virus (Covid 19) specially the Chatbots. After define it we will try to explore the advantages and disadvantages of it, how feasible to use it in public services, how can government benefit from such applications in best ways and will finalize with the conclusion wither it -chatbots- can be an efficient replacement to the customer services human representative in the future or no.

2 Methodology

Before collecting the research data, I have done a lot of research on the internet about Chatbots and its uses earlier and present and how it is used by companies and government agencies, and has dealt with more than 8 chatbot (Siri by Apple, Google Assistance, Fatema by ila, Ask BBK, Z-bot by Zain, E-Aramex, TRA, Rashid by Smart Dubai,) to see how its interact and how it easy to use.

But to collect the research data I have used mixed method by distributing survey and doing lecture review on previous studies and academic researches, the survey was randomly distributed in Arabic and English in the period between 4th to 10th April 2020 to more than 300 people working in the fields of customer service, clearance, students, and others who are considered clients of government agencies, and got 58 responses, 49 of them were employees, 6 unemployed and 3 students, half of them range Ages 21 to 30 years and 40% between 31 to 40 years old. The survey included 5 main multiple-choice questions about what customers prefer in obtaining service from government agencies and about the feasibility of using the chatbots, especially with coronavirus outbreaks. Using google forms tools to collect the data and excel sheet to do the data analysis which will present it in pie charts in this research various sections.

I have also reviewed 9 previous researches and academic articles from different universities in the United States, Brazil, Europe and China - mentioned in references - on many topics related to artificial intelligence and its uses in public services, how it works, and best practice to promotes it.

3 Lecture Review

The services provided by the government are the first points of interaction between them and all members of society, whether citizens, residents or visitors. Several decades ago,
many countries began using the latest technology, such as computing and the Internet, to provide their services. Governments aiming to excel and develop should start looking for more innovative ways to deliver and improve their services with modern technologies and artificial intelligence.

3.1 AI in Government Services

Among the benefits provided by artificial intelligence, savings in the operational costs of government departments, faster decision-making and solutions to citizens’ requests and inquiries, more accuracy in keeping records and processing them by eliminating human error, government workers are freed to do more creative and strategic work and more, the governments had benefits a lot from AI technologies in many sectors among which we can mention the below:

3.1.1 Diversification in Uses

3.1.1.1. AI in Education Sector
School digital systems in the sense of creating interconnected data networks, through which large-scale neural networks can be created, which can expect weaknesses and how all students can address them and contribute to information management and directly address problems (Sousa et al. 2019). It’s also contributed to the work of algorithms in creating educational tools that reformulate and detail educational curricula in a way that suits the interest of students, in order to reach the shortest way to present study materials. Developing students’ abilities to communicate with human-like systems, which are their largest motivator and prepared and equipped for immediate interaction with people in all linguistic and social situations, which helps to enhance the ability to communicate and increase social skills.

3.1.1.2. AI in Health Care
Hospital physicians can analyze massive data sets that contain information that can save lives by running algorithms designed with artificial intelligence (Greene and Greene 2019). These algorithms have many applications within hospitals, and they play a useful role when examining large amounts of data, which enables healthcare professionals working in emergency departments to access and sort large amounts of information within a short period of time, which improves the critical time that is devoted to one patient Optimally (Greene and Greene 2019) mentioned that Artificial Intelligence also plays an ideal role in optimizing the movement of hospital patients arriving and leaving the hospital in an optimal way, through the help it provides in finding vacant beds, which is one of the challenging problems across the country and the world. In this case, predictive capabilities of artificial intelligence can enable hospital staff to efficiently schedule surgeries, thus investing hospital resources as efficiently as possible.

3.1.1.3. AI in Traffic Management
Traffic congestion is a problem and a major challenge for many cities in the world, due to its negative consequences for the economy and the standard of life in the city. This problem is exacerbated by the continuous increase in the number of cars, whose
number is expected to double to more than two billion cars around the world by 2040. Artificial intelligence is one solution that has opened a new window of hope to solve this problem (Sousa et al. 2019). In the Indian city of Bengaluru, which has an average speed in some respects at peak hours to 4 km per hour, the city, in cooperation with the German company “Siemens”, built an experimental monitoring model that uses artificial intelligence technology through the millions of traffic cameras deployed (Sousa et al. 2019). In this context, traffic cameras automatically identify vehicles to send information to the central control center where algorithms estimate traffic density on the road. Accordingly, the system makes changes to the traffic lights based on the information in real time.

3.1.1.4. AI in Energy Sector
Artificial intelligence enables energy ministries to provide solutions to improve energy use, by monitoring the energy consumption behavior of individuals and companies (Sousa et al. 2019). The Spanish company “Nnergix” uses machine learning technology to forecast weather and weather conditions, including the amount of light energy produced by power stations every hour. Google also launched a tool to calculate the impact of solar energy use on households across the United States, and the money saved as a result of solar energy use. Artificial intelligence also helps monitor equipment and detect problems and malfunctions before a crisis occurs, save money and time and save people’s lives, and many startups try to provide this service to the energy ministries (Pan 2016).

3.1.2 Chatbots in Government Services

3.2.1.1. What is Chatbot?
Before we discuss the uses of chatbots in government services, we will briefly mention the definition of chatbot as mentioned by the specialists in the field of artificial intelligence: Chatbot is a computer software that simulates natural human conversation by texting, voice commands, or both together. Chatbot is a short for Chatter bot, which is an Artificial Intelligence application that can be used through any chatting or messaging application (Shawar and Atwell 2007). The history of chatbots backs to the year 1950 (ELIZA) and 1966 (A.L.I.C.E.) which are samples of early chatbots applications, where the main objective was to minimize human interaction in chats. While currently, chatbot concept has developed. Nowadays, chatbots have features that may distinguish one human agent from the another.

3.2.1.2. How Does it Work?
If its voice conversation, the chatbot will turns the voice input to text by using Automatic Speech Recognition. But if it is text conversation only then chatbots skip this step. The chatbot after that will analyze the text and will determine the best Answers and send it back to the customer. And it can reply the answers in many ways such as text, voice via Text to Speech tools. Taking in consideration that understanding humans is difficult for the machines (Shawar and Atwell 2007). That’s why chatbots need to have these two natural language principles:
Natural Language Understanding (NLU): the ability of chatbot to understand natural human, or technically it is the process of converting text into structured data for a computer to understand.

Natural Language Processing (NLP): is the capability of the devise to understand and analyze human speaking, find the best answer and reply in understandable language for the human users.

Chatbots also use the Machine Learning (ML) which is the ability of the computer to learn by itself from customers inputs and requests.

3.2.1.3. Usage of Chatbots in Governments
Unlike the privet sector the public sectors adoption to the chatbots is slower, perhaps because the first one is always looking to decrease costs and provide better services with less resources, while the second gives great importance to the issue of employment, or because many governments are still thinking with the same old mentality, such as the citizen is who need the services, so there is no need to do more (Sousa et al. 2019).

However, there are many successful experiences with many government agencies that have resorted to using the chat program to provide their services to citizens, among which we can mention:

- **GovBot – Germany**: its help citizens in answering the administration queries by depending on integrated network for the administrative knowledge.
- **CHIP – Los Angeles**: it was launched for Los Angeles Business Assistance Virtual Network (LABAVN) and its answering more than 180 customer on daily basis. Based on their reports its help in reducing mails by 50%.
- **Alex – Australia**: it belongs to Australian taxation office to assists citizens in their tax-related questions.
• **Citibot – North Charleston:** text-based conversations app in North Charleston, S.C. which helps the local people to complaining, report or inquiring for any city services.

• **Rashid – Dubai:** published by Smart Dubai to make people who are living in the city life easier by providing them with all needed information about the city and the provided services.

### 3.2 Feasibility and People Preferences

To find out the feasibility of using the chatbot by government agencies, we have categorized it as part of a set of service channels that are currently provided by government agencies such as direct service centers, call centers, electronic services and mail, and because many people are not familiar with the concept of chatbot we started asking them about direct chat and then we included in the questions to the chatbot in a way that explains the meaning to them, and when we asked them about which of these channels they preferred to use to obtain services and information from government agencies, the result came that almost 66% preferred to make a call to the call center, and 26% - the second percentage - preferred to use live chat, while the remaining 8% preferred to visit service centers and send e-mail.

And to distinguish the answers of those who have knowledge of chatbot from others who do not distinguish between it and direct chatting, we asked them if they had dealt with chatbot before or no, whether it was affiliated with a public or private party, and the result was positive as 43 out of 58 people, i.e. 74% answered yes they had used the chatbot.

The last question about the feasibility of using a chatbot in government agencies was whether customers support having a chatbot system that provides them with the services and information they need from the government agencies or no, and the result was that 93% of respondents to the survey supported the existence of a chatbot system in government agencies:

### 3.3 Benefits of Having Chatbot for Government Services

When people see the presence of a chatbot icon on a ministry or any government site it shows an indicator of easy accessibility to this agency. How fast are these chatbots can answers to thousand questions and complaints, and its availability on weekends, public holidays and within nonworking hours, gives the citizens more trust in their government agencies. It’s also benefitted the government agencies as their human employees are free to innovate and more focus on processing applications, implementing roles, and developing their own process.

Then we can classify the benefits of the chatbot for government services for two groups, benefits for citizens and benefits for the government itself, we summarize it in:

#### 3.3.1 Benefits for Citizens

- **Quick Access:** It allows users to easily obtain the information with one click of a button and start requesting the service or information from the main page of the site, without the need to branch into the site map to obtain the service, and it can collect more than one information from more than one place in one answer.
- **Online Complaints:** It can be used as a tool to receive citizen complaints, instead of sending an email or calling service centers, the user need only record a voice message or text the problem, then the system will process the content and verify all information and requirements and assign it to the concerned department in short time without need to enter any Human component.

- **Online Forms:** Since the chatbot can dictate any questions on the application form and the customer answers them consecutively in the same conversation, the chatbot program enters the information received in the same pool of applications and generate a reference number for the customer as if he had sent it manually at one of the regular service centers.

- **Fees Payments:** Because systems integration is one of the basics feature in the chatbot, it is easy to link it with an electronic payment gateway that enables citizens to pay taxes and fees for government services such as electricity, water, housing, accommodation and other fees through the chatbot itself.

- **Time Saving:** It avoids citizens waiting in waiting queues at service centers or even the time they spend accessing the service center, and it also avoids them waiting for their call responses from call center employees or waiting for an e-mail response.

- **Privacy and Comfort:** When the customer knows that the other party in the conversation is a robot, that will make him more comfortable in requesting information or telling the problem, unlike if the human element is present, then the customer may feel embarrassment or lack of privacy.

- **Free Service:** In case of citizen travel, they can obtain the service from the chatbot without paying additional fees as if he had contacted the call center.

### 3.3.2 Benefits for Government:

- **Addressing Citizens Issues:** It facilitates the process of identifying and solving problems faced by citizens because the process of obtaining the reports of the services provided and complaints received is easier and faster than other service channels.

- **Service Delivery:** Delivering services and information using chatbot is much easier than using the human element that needs continuous training, continuous monitoring and longer time to receive and deliver information to clients.

- **Availability:** Government agencies can provide their services 24/7.

- **Improving KPIs:** Because it guarantees the speed in completing operations directly, and thus raises the quality of the service provided in terms of time, the services that are required to provide hours, provided by the chatbot in less than a minute.

- **Easy Integration:** Ease of integration with any other system, whether it is a government agency or a private company system, and even with other applications such as messengers and chat apps. at no additional cost.

- **Multilingual Support:** By integration with a translation system chatbot can respond to any language and thus the service agencies can provide their services in various languages without the assistance of a translator or without requesting more knowledge of a languages at the time of employment.

- **Multiple Platforms:** It can be run on more than one platform simultaneously such as website pages, smart applications, messaging applications and social media.
3.4 Effectiveness of Chatbot Performance

In this part we will discuss the Chatbot social characteristics which grouped into three categories: conversational intelligence, social intelligence and personification (Chaves and Gerosa 2018). The first category which conversational intelligence means of characteristics which enable the chatbot system from managing interactions. While the Social intelligence category talks about the habitual social protocols, and personification is means of the chatbot perceived identity and personality representations (Sousa et al. 2019).

Conversational Intelligence: What is meant here is the ability to make the conversation successful through a correct understanding of the customer’s speech and an understanding of the type of speech whether it is a question, a complaint, a suggestion or otherwise so that the chatbot can respond in the appropriate way to the question, and this process mainly depends on the type of nutrition that the chatbot gets, As the researcher emphasizes for every answer that chatbot answers, there must be more than 10 question variations at least (Chaves and Gerosa 2018).

Social Intelligence: Means that the chatbot is able to understand the emotional and psychological state of the customer, which is an advanced stage in the first stage, so that the system, through its analysis of the sent words or the tone of the customer voice, can be able to determine the emotional state of the customer, whether he is happy, angry, or sad to be able to choose answers appropriate to the client’s emotional state.

Personification: It is the most important point, and it relates to the previous two points. This means that the chatbot is human in nature, so it is difficult for the client to distinguish whether the speaker on the other end is a person or a robot (Chaves and Gerosa 2018). To achieve this, choosing an identity or brand name for the chatbot must be smart enough to suggest a challenge to the ability of this chatbot to satisfy customer requirements, Second, it feeds on common phrases used in everyday life. Instead of starting the conversation with the word “hello” which gives the character that the speaker is a machine, you can start with “Who is here?” Or “I had the honor; how can I help you”. Third, it should understand the local dialects and the ability to speak them. With the first two components properly applied, it will be difficult for the customer to distinguish the device from the employee providing the service.

And to find out the importance of the chatbot social characteristics to the clients who use it, we asked a question within the survey about whether the speaker is a robot, will it make a difference to the customer instead of being a real person? The result was that 69% of them felt the difference in the service provided, while 31% did not regard this difference as important comparing to obtaining the required service or information:

3.5 How Chatbots Would Help During Covid-19 Pandemic Outbreak?

Since the outbreak of the Corona Virus pandemic at the beginning of 2020, many activities, sectors, and private and governmental services have been affected as a result of the implementation of social distance and domestic quarantine policies. In service agencies,
the impact has been on two parties, customers and front-line customer service employees. For the customers, many agencies have enforced laws stating that no more than 5 people are present in one place while keeping the distance between them at least 1 m away. Other institutions implemented an appointments system to avoid overcrowding. All of this led to delayed transactions and customer dissatisfaction, on the other hand exposed them to the risk of injury by providing services directly.

As for employees, these organizations have taken preventive measures, including reducing the number of employees at each branch and instructing the rest to work from home. Other organizations have used some modern communication programs to provide their services indirectly, such as Microsoft Teams and Zoom and others, actually these measures were also not enough, as there are still direct communication in these centers, although it is limited with co-workers and some customers, but the risk of a virus outbreak among this group is still present.

What I would like to say is, if these organizations had a chatbot system, they would have contributed a lot to preserving safety of both customers and employees, and also to preventing outbreak of the disease. Chatbot as a system that works in cloud base does not require the presence of employees in the workplace, it can be managed and fed with information and extracting reports from it while the employees in their homes, the same applies to customers who can, as we mentioned above in the benefits of having chatbot any customer can access to information easily, quickly and safely. Consequently, these institutions will be able to prevent direct communication completely, and even to close their branches in some cases. And what we suggested is consistent with the opinions of respondents, as 76% of them emphasized the need to use artificial intelligence technologies and chatbots in government services to reduce the spread of the disease, while 24% believed it might be useful to use these technologies.

4 Conclusion

With its many benefits and the huge difference that may occur in the future of services, the chatbot cannot be an entier substitute for the human component in customer service - at least for the next ten years – it need continuous nutrition, development, programming, and even review by the human component. Yes, the implementation of chatbots in public services may reduce the burden on the rest of other channels employees, and it may empty many of them for more important and creative tasks, but it will not be a substitute for a customer service employee.

The chatbot, with its many benefits that we mentioned, represents a large part of the future of the services sector, which private companies have begun to implement in a large picture, governmental agencies that are also seeking to excellence must enter the race for technological development through the use of artificial intelligence applications, which is the chatbot is the most important in the field providing information services and assistance. Regional governments may need several introductions before they begin in this field, as many studies need to be conducted on these applications, as well as the intensifica9tion of education and technical awareness to make citizens aware of the artificial intelligence programs and how to use them.
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