

Chatbot Improves the Customer Service in Four Important Industries

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Abstract. Chatbot was first introduced in 1966. With the development of Artificial Intelligence for decades, the function and usage of Chatbot have been enhanced to a very high level. In this paper, we are going to talk about how the use of Chatbot improves the customer service in four industries: healthcare, advisory, commercial, and education. They are the four important social fields, and they all have very large demands and uncountable customers every day. The human agents are facing tons of customers from various backgrounds. They need the help from artificial intelligence. Apart from that, we will also discuss some special advantages of AI-based chatbots which they work so effectively in customer service. These three advantages are automation, trust, and productivity. With the combination of these advantages, chatbot can be highly supportive in the field of customer service and improve the quality of customer service. Eventually, we will talk about some challenges the chatbots are facing now, and how to make it function better in customer service to meet more users' expectations.

Keywords: Chatbot; Trust; Automation; Productivity; Customer Service; Education; Commerce; Healthcare; Advisory.

1. Introduction

In 1950, Alan Turing, who was considered as one of the greatest computer scientists in the history, proposed an idea "Can machines think?" Then, in 1966, the first chatbot named ELIZA was created by MIT, and it was able to generate satisfactory response according to keywords and matched patterns [1]. Now, in 2022, Artificial Intelligence is considered as one of the most important and advanced technology in the world. The improvement of computer technology has brought chatbots with much stronger abilities. The reason of developing better chatbots is linked with the large demand. Why people need chatbot?

In order to figure out why people need chatbots in their daily life, we need to find out what advantages chatbots bring to people. There are mainly four advantages – ease, speed, convenience, and quick access to information [2]. When we are talking to a chatbot, all we need to do is to type the query on the user interface. Then, the chatbot will generate the response according to our inputs in a very short time. The whole process is very easy and quick. Also, most of chatbots are accessible because they are used online. As long as our mobile devices are connected to Internet, we could talk to various chatbot according to our own needs. Some people might ask why the users prefer talking with a computer-based agent instead a real human agent. One study was conducted to compare random human IM, which is Instant Messaging, with random human conversation with chatbot to see the difference between human-to-human. The result shows that human beings send less words to Chatbot than to real human. Also, human beings are modeling their communication with chatbots, like the way they are adapting their own language [3].

Next, we move our sight to a field which seems far away from computer science – customer service. Customer service is defined as a management strategy which is used to meet the customer's expectations, and the agents working in the business need to understand what the customers need in order to provide satisfactory responses [4]. According to this definition, it seems like we can build some connections between customer service and chatbot because chatbots are able to generate responses according to the users' input.

Then, let's specifically talk about what chatbot's functionalities could be used in the field of customer service. Generally, chatbot can be split into five types: task-oriented, social, service-based, knowledge-based, and dialogue-based. The dialogue-based chatbot can be used in customer service because it is designed to engage with user. It is composed with three parts: User Interface, Data Processing, and Integration Components [5]. With these functionalities, and some advantages of chatbot we talked in paragraphs above, applying chatbots in the field of customer service is very possible. Compared to real human agents, computer-based chatbot is able to provide service in 24 hours and 7 days each week. However, only with these qualities, we can't conclude that chatbot can improve the customer service. Hence, we are going to talk about more in the following paper.

Customer service is needed in many industries. It is impossible to talk about the application of chatbot in each of them. Finally, we select four of the most important industries that are linked with all the people in society. They are Healthcare, Advisory, Commercial, and Education. Through lots of research about the connection between chatbot and customer service online, we conclude that chatbot is able to improve customer service in these four industries.

2. Advantages of Chatbots

2.1 Automation

Automation can be considered as the most important property of chatbots. The chatbot can be defined as "automate system that emulates person-to-person dialogue through text or voice message [6]." According to this definition, we can see that the original purpose of designing and inventing chatbot is to finish automated tasks. Then, if we move our sight to the field of customer service, we can see that it really needs the help of chatbot. The customer service continuously has more improvements and larger extension in recent years. As a result, there are more and more customer requests [7]. The human agents are not able to provide help to all the customers at the same time. However, with the help of chatbot, this problem can be solved very easily because of chatbot's automation ability. Chatbot is able to talk to many users at the same time and provide personal service to each customer who needs help urgently.

2.2 Trust

The word "trust" is considered as having faith on a thing or a person. It means that if we trust someone, we have faith on him/her. Then, how are we supposed to put truth on machine. When we are talking with a chatbot, we need to share some personal information with it so that the chatbot will be able to generate useful responses for us. Then, there is a concern about this part – the privacy of our personal information. A survey conducted by Saglam, Nurse, and Hodges on the SurveyMonkey platform focused on the potential risks concerning interaction with chatbot and factors which make them have trust on chatbot. According to the result of their survey which is on Fig. 1, we can see that the most two concerns are "how to delete" and "inappropriately used" of their personal data [11]. What if our own data is not deleted after the end of conversation? What if our own data is inappropriately used by the company behind the chatbot? Apart from that, this survey also asked the participants about why they have trust on chatbot. The top two responses are "response quality" and "grammatical correctness [11]." We can that the quality of response and the context of response really matter. Also, another survey conducted by Følstad, Nordheim, and Bjørkli found more specific factor that make users have trust on Chatbots. Those factors are "interpretation and advice", "human-likeness", "self-presentation", and "professional appearance [12]." "Interpretation and advice" refer to the notion of the qualities of machine interpretation and response. "Human-likeness" is how similar is the chatbot talking like a human. "Self-presentation" is related to the chatbot's communication skill, and "professional appearance" is determined by how professional the chatbot is in the specific field [12]. The uses have more trust on chatbot if the chatbot can do well on those four factors we talked above. However, these are all the user-related factors. There are also environmental related factors. Another paper, also wrote by Følstad, Nordheim, and Bjørkli, explained two environmental factors

that determine the users' trust on chatbot. The first one is risk which is the undesirable outcome by talking with the chatbot. The second factor is brand. Brand is the service provider, and it can be considered as the company behind the chatbot [7]. If the service provider is well-known company, like Microsoft and Google, the users might have more trust on its chatbot.

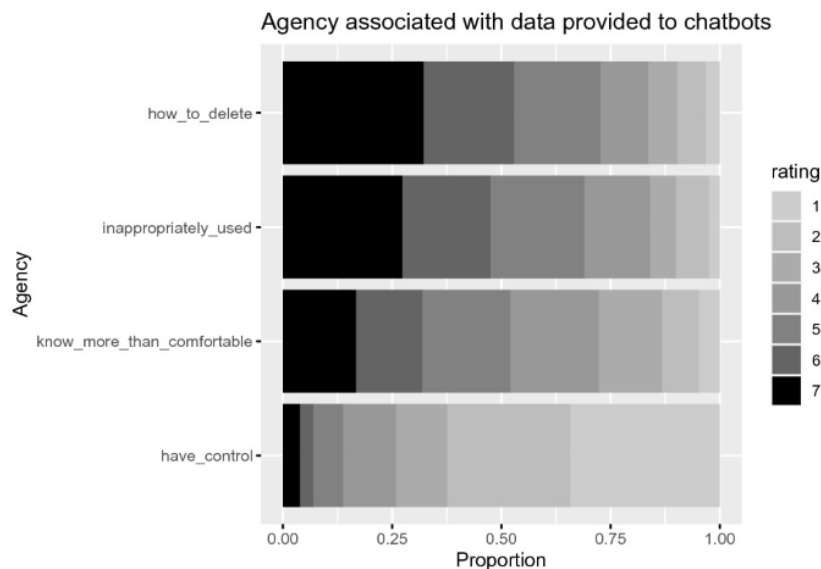


Fig 1. User's concern of using chatbots [11]

2.3 Productivity

The productivity of chatbot can be split into two parts: productivity to users and productivity to the company behind the chatbot. First of all, let's talk about how chatbot improves the users' productivity. It is saying that the users expect the chatbot to be effective and efficient [8]. The only thing we need to do is to tell the chatbots what we need, and then it will search the database that match the input query the best. The whole process is very easy, and it is very fast so that it saves the users a lot of time. Also, with the improvement of Machine Learning and the using of better algorithm, the chatbots are able to find generate the satisfactory response. Effectiveness and efficiency relate to productivity. In most cases, the motivation for the customers to use chatbot is productivity [9]. The users are enjoying the productivity brought by chatbot. Apart from that, the chatbot is able to improve the productivity to the company behind. In business, the use of chatbot makes the social and organization relations more easier and user friendly [10]. Some companies are designing the chatbot for employee management. Chatbots can help with tasks like employee record maintenance and performance review [10]. With the help of chatbot, these tasks are turning to be much easier. Then, let's move our sight to the company which needs to provide satisfactory customer services. Currently, by using the chatbot, the customer service has been improved to a new level. One important characteristic of chatbot is automation. It is almost impossible for one human agent to talk with several customers and help them to solve the problems. However, chatbots can do it easily. The chatbots are able to talk to each customer and generate responses according to the user's query. Also, the study finds that people are willing to have conversation with chatbots [3]. The chatbots help the company to deal with the problem of overwhelming customer service and increase the company's productivity.

3. Application in Four Industries

3.1 Commercial

Commercial is a very big industry in our society. By talking about the application of chatbots in this industry, we mainly focus on e-commerce. E-commerce is defined as "the use of electronic means

and technologies to conduct commerce [14].” Most of chatbots used in e-commerce industry are task-oriented [13]. Compare to human agents or human sellers, what advantages do chatbots have?

There are actually a few advantages of using chatbots in e-commerce. The first one is cost. Applying chatbots has a lower cost than human representatives, and chatbots only need maintenance in a certain period. Compare to the human agent’s monthly salary, the chatbots’ maintenance cost is much lower. The second advantage is that chatbot makes less mistake. Since chatbots generate responses based on its knowledge, the answers are more reliable [15]. It’s a very important factor of customer service in e-commerce to generate correct answers to make customers have trust on products. Also, compare to human agents, AI-based chatbots won’t have negative emotions or feel exhausted, and they are always positive [16]. After one day’s working, the human agents might feel tired, and it’s hard for them to always keep a positive emotion while facing the customers. Now, with the application of chatbots in e-commerce, they are able to provide positive attitudes towards the customers all the time. It could enhance the customer service. The third advantage of chatbot is its ability of handling large number of customer communications [16]. The purchases of e-commerce happened online which means that the chats between the customers and agents are through typing or oral talking. The human agents might have the problem of having several customers at the same time, but they can not provide responses at the same time. However, this work can be done by chatbots easily because they can talk to several customers at the same time and generate responses according to each customer’s demand. Then, the customers won’t have the problem of waiting in line. Sometimes stuff are asked with the same question by a variety of customers, but chatbots make it more cost-effective [17].

There is a chatbot named SuperAgent. It has three advantages. First, it can leverage crowd-sourcing styles. Second, it uses NLP (Natural Language Processing) and machine learning techniques. Third, it integrates into e-commerce websites as an add-on extension [17]. With these three factors, SuperAgent is able to make customers’ shopping experience better.

Actually, apart from e-commerce industry. Chatbots can be used in other commercial places like hotel. Gunawan et.al introduced a chatbot named Bershca used in Indonesia. It has shown that the customer satisfaction has great impact to hotel’s profit. This chatbot is a front-end application. The front part is built by Google Flutter, and the end part is based on Python plus AIML (Artificial Intelligence Markup Language) [18]. The basic structure of Bershca is on Fig. 2.

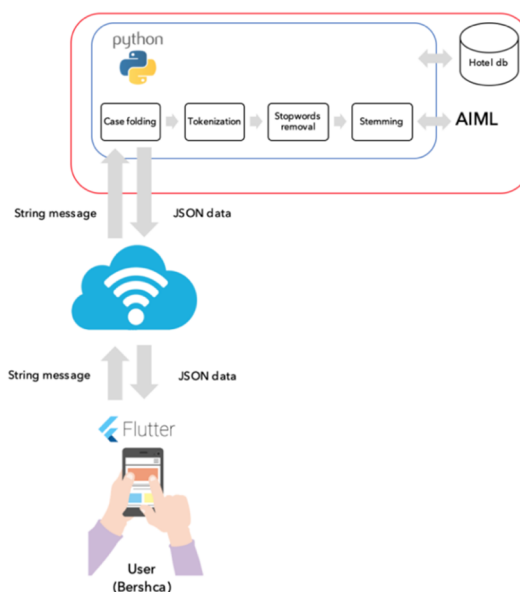


Fig 2. The basic structure of Bershca [18]

3.2 Healthcare

Healthcare is so important to us because we get illness, and we need treatments for our health. In the past three years, COVID-19 has become a global virus. Everyday there are more people infected.

However, the face-to-face service is limited to prevent the spread of virus so that there's more need of digital self-service to help customers [19]. Chatbot, which is the AI-based technology, has the ability to talk to several customers and generate response according to the customer's needs. Hence, chatbots are adopted by lots of hospitals to provide healthcare. For instance, some famous healthcare institutions like Babylon Health, Ada Health, and Your.MD offer chatbots to check patients' symptom [20].

Why we need chatbots in healthcare and how they can help patients? Sometimes, when the patients are going to hospitals, it is time-consuming for some people. In this situation, they can reach to chatbots for help because chatbots provide users with real-time interactive service at any time and any space [21]. This is one advantage of chatbot in healthcare because the hospital might have patients at any time. Also, Winkler and Söllner asserts that chatbots are able to provide patients with information and consultations at the time of hospitals discharge [22]. Additionally, now chatbots have the ability of recognizing users' emotions and generate response based on the current patients' mood. Chatbots can show empathy to patients [23]. It helps patients to relax. It turns out that patients with depressive symptoms prefer to receive help and support from chatbots [23]. Another advantage of chatbot is that it has the potential to improve access to health care by providing remote counsel with low cost. It helps some patients with medical burden [20].

3.3 Advisory

As the name "advisory" implies, the main goal of this industry is to provide customers with advice. Sometimes people need advice from other people because they are not able to make a decision by themselves. In order to improve the customer service, the advisory chatbot is invented. The role of this type of chatbot is to provide suggestions and give recommendations on service. Also, it can contact people and provide users with support and advice [24]. In this section, we are going to talk about the advisory chatbot used to provide career choice and advisory chatbot used in school.

In lots of cases, the unemployment rate is connected with the lack of proper career guidance [25]. People lose their jobs because they choose the wrong jobs which do not fit for themselves. In order to avoid this problem, the advisory industry needs to provide people with the most suitable jobs according to their backgrounds. A career counselling chatbot implementation method is introduced by D'Silva et.al. Basically there are three step. First, they conducted psychometric test on the participants to identify their personalities. Second, they trained and mentored the participants to find the suitable job. This step helped chatbot to find the participants' learning style and know more about them. Third, the chatbot generated a professional resume according to data gathered from participants and provided a list of recommended companies [25]. The result generated in this way is more personalized and suitable. Apart from employed people, students in the college also need career suggestions because they are going to start working after graduation. The chatbot using Microsoft Bot Framework is introduced to help to write CV and find jobs [26]. To train the bot and get useful data from the users, this chatbot is constructed with seven main entities in Fig. 3.

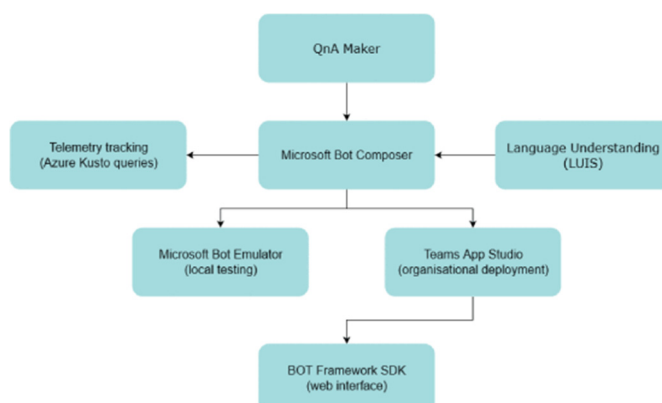


Fig 3. Seven main entities of chatbot [26]

Students not only need advisory for career choice, but also they need advisory in school. In campus, sometimes students are having trouble with school's information, but they can't always reach to school's staff for help. In this situation, chatbots can provide them with assistance. The chatbots used in school can provide students with a list of helps. 1. Help students to acquire information about admission date, course cut-off days, and course eligibility. 2. Help students discover classroom and find building location. 3. Help students to find information on school's activities and competitions. 4. Help students with interviews and job preparation [26]. By taking a look at a real example of chatbot used in school, we can see how much help the chatbot is able to bring to students. There is a chatbot implemented based on AIML (Artificial Intelligence Markup Language) to help students at Manipal University. Its main job is to help students to fetch information from school's system. The information includes the rank of university, availability of service, university environment, updates of activities, and academic information [27]. Then, the students do not have to search website for specific information or go to staff's office to ask questions. It's the special customer service for students at university, and it has been improved by the application of chatbots.

3.4 Education

Education is very important to all the human beings. Education helps us to gain knowledge, have the ability to interpret other things, make us better citizens, bring us with confidence, ensure a better future, and helps us to build our own characteristics. (50 From primary school to college, education is a very long trip. Hence, education is a very important industry in our society. How are we supposed to link this important industry with chatbot? Actually, chatbots are still at the very beginning stage in education, but it has proven that chatbots have positive effects on students' learning process and student satisfaction while learning [22].

By designing the chatbots for education, we are aiming three goals. 1. Improve communication. 2. Minimize ambiguity. 3. Increase productivity [28]. Communication is very important in education, and other studies found that chatbots have great potential in education because of its ability to communicate through natural language [29]. With the development of machine learning and Natural Language Processing, chatbots have been improved to talk like a real human being. One important reason to adopt chatbots in education is because of global health crisis, so there's more need of technology methodology, and schools need to implement new information and communication technologies for remote learning [29]. Chatbots can provide help because they are able to answer questions online and provide students with help for learning process. It has been shown that chatbots can help students to learn in a more didactic and efficient way [29]. In the "productivity" section above, we talked about how chatbot improves the user's productivity for work. Productivity is also one important element of study. If students have higher productivity while using chatbots for study, they would be more efficient.

Chan et.al introduced the audience with a chatbot for elective course selection, which named EASElective from Open University at Hong Kong. Its main job is to provide students with elective course advising [30]. Sometimes students have trouble with reaching school staff for advice while choose the elective course. At this time, students can ask chatbots are help. Chan et.al mentioned that there's more diversity within student's group so that there's more need of this intelligent chatbot to provide advice to students [30]. Apart from providing course advises, chatbots can do other tasks like sending reminders of exams. Also, the chatbot's generative system can help students to understand the curriculum. The developing of NLP (Natural Language Processing) helps the chatbot to understand student's questions [31].

4. Summary

According to those advantages and studies, we can conclude that the using of chatbots can improve the customer services. There are three important factors of chatbots which are automation, trust, and productivity. They make customers have the interest of using chatbots. The satisfaction of using

chatbots improves the quality of customer service. Commerce, healthcare, education, and advisory are four important industries in our society which have impacts to almost all the citizens. Nowadays, chatbots have been used in all four industries. We found that chatbots are able to improve the customer service in these industries. Currently, chatbots are still at the beginning stage of markets. We can still make improvements on chatbots. For instance, chatbots do not have memory which means that each time we are talking with chatbots, they can't connect the current conversation with the last conversation. Also, even though we talked about the factor of trust of chatbots, customers can't have trust to chatbots all the time because they are worrying about the leak of their own personal information. All in all, we believe that the future of AI-based chatbots is bright and chatbots could be applied in more industries.

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