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Chatbot: A Conversational Artificial Intelligence (AI) software based on Natural Language Processing (NLP)

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ABSTRACT: Conversational AI is the technology which offers human like interaction with computer via text or voice. Chatbot is a typical example of conversational AI in which a computer program designed to simulate conversation with human users. This technology can mimic human conversation and entertain users. It is an intelligent system developed by Artificial Intelligence (AI) and Natural Language Processing (NLP) Algorithms. They are useful in information retrieval in the fields viz. education and business. Conversational AI has ability to carry out highly personalize interactions with large numbers of individual users. In this paper, it discusses the flexible attribute of chatbot which is beneficial and can be used easily in any industry. The paper also studies whether the customer is satisfied by the services provided by the chatbot and discusses their maintenance cost which required to keep the chatbot in good working condition.

KEYWORDS: Chatbot, Artificial Intelligence, Natural Language Processing, Flexibility, Maintenance.

I. INTRODUCTION

Artificial Intelligence is a branch of Computer Science dedicated to the development of some tools and techniques that can mimic the capabilities of the human mind. Nowadays, people are more fascinated with Artificial Intelligence (AI) gadgets. In Artificial Intelligence, Conversational AI is one of the technologies in which the chatbot is developed to interact with people in a human-like way by reducing the gap between human and computer language communication. Earlier chatbots were typically used in customer service environments but now it is also used in various other fields like business, education and many more.

A Conversational AI chatbot offers a way to solve customer's issues by simply asking for whatever they need and whenever they want from wherever they are. It is relatively easy for a chatbot to switch from one field or industry to another by just training the bot and giving the right conversation structure. Customer satisfaction is also an important aspect of the chatbot. They should be satisfied with the services of it so the tendency of industry or field arises. Chatbots can easily communicate with thousands of people at the respective time. Through it, the expenses get reduced and maintain the cost, and also brings customer satisfaction. It could be either text-based or voice-based; most of the time it is accessed through the internet. It is developed using Natural Language Processing (NLP) algorithms through which it answers the user questions. It also increases the benefits of business by providing a better circumstance with low cost. Conversational AI allows a chatbot to deliver an intelligent, high-level, and customized customer experience. Customers can ideally connect with the chatbot via the channel of their choice. They provide synchronous conversations which reduce the risk of information inconsistency. The advantage of implementing conversational AI increases customer support efficiency.

II. OBJECTIVES

1. To attain knowledge regarding chatbots.
2. Demonstration of application and working of chatbots.
3. To understand the maintenance cost of the chatbot.

Following hypothesis is proposed to attain the above objectives using survey analysis: -

H1: Customer who operates chatbot experiences good flexibility and satisfaction at low-cost maintenance.

III. RELATED WORK

The M. Dahiya [1] proposed that a chatbot is a great tool for quick interaction with the people. They answer the questions which are hard to find. The author had given the information about the implementation and the design of the chatbot. In addition, comparison had been made with others chatbots and its application in various fields. In A M Rahman et al. [3] gave an overview about challenges of programming in current and future era of chatbot and the general description about cloud-based technologies along with its programming. They proposed that chatbot increases the effectiveness of business and a simple chatbot is not a challenging task than a complex chatbots and developers should understand and consider the quality of being steady, produced in a range of capabilities and flexibility issues along with high level of intention on human language. The progress in machine learning techniques may be able to handle complicated conversation issue such as payments correctly. In E. Adamopoulou et al. [6] proposed the basic principles and fundamental concepts used to design and develop the chatbot. They could reach to many audiences on messaging apps and be more effective than humans are. At the same time, they may be called as a capable information gathering tool. In S. Kim et al. [12] studied that the chatbot survey produced high-quality data and provide support for the feasibility of using a text based chatbot as a virtual interviewer. The T. Lalwani et al. [13] implemented a chatbot whose architecture combines a language model and computational algorithm to copy information of online communication between a human and a computer using natural language programming. The Thomas M. Brill et al. [14] proposed that the customer satisfaction had been a focal point in extant marketing and information technology literature. These Study influenced stronger user perception of trust and customer satisfaction evaluation.

IV. APPLICATIONS OF CHATBOT

Using Conversational AI in chatbot upgrades the overall user experience.

- A. Chatbots designed by conversational AI is often used by most of the shopping portals offering quick and 24x7 resolve to the queries of customer online.
- B. In the banking and financial sector, chatbots are exceptionally high, finding execution in various reputable corporations across the world. The complex functioning, such as loan applications, transactions, are now being controlled through AI bots.
- C. In the e-commerce sector, chatbot allows users to interact with it beyond the menus and buttons. Now, it's majorly used in price-setting alerts, order products, buy gifts, reserve services such as bookings for hotels or restaurants in advance, and track the order.
- D. The chatbot also resolves travel-related problems like planning for vacations, bookings, etc., and solves the customer's complaints.
- E. Other sectors like healthcare, media, finance, and insurance chatbot play an important role in helping them to develop in their sectors.

V. METHODOLOGY

A. PARTICIPANTS

An online survey was conducted using Google form and the link of the form was distributed among various people. In the form, questionnaires were created to test the proposed hypothesis. Through it, two conditions i.e flexibility and maintenance cost were concluded. In total 45 responses were collected from different people, in which 51.1% was female and 48.9% was male.

B. WORKING

There is three primary classification mechanism to run a chatbot.

i. Pattern-Matching:

Chatbots use a pattern-matching mechanism to classify the text and produce response suitable for the customers based on the keywords. A standard system design of these patterns is AIML (Artificial Intelligence Mark-up Language). In pattern-Matching, the chatbot answers only those questions which already exist in their model. This mechanism cannot go beyond the corresponding pattern.

ii. Algorithms:

Algorithms create a unique pattern in the database to respond to each type of question. It creates a hierarchical structure with groups of combinations on a pattern. It is used to reduce various classifiers and creates a more feasible structure. It reduces the problem and gives a simplified solution. Among various algorithms, Multinomial Naive Bayes is the best algorithms for text classification and NLP.



iii. Artificial Neural Networks:

Artificial Neural Networks gives the solution and a way to calculate the answer to the questions using weighted connections and context data. It breaks every sentence provided to the chatbot into different words and takes every word as an input for the neural networks. Neural Networks are stronger and provide accurate sets of answers to common queries. For using these tools in various sectors users need to train their chatbots to become more efficient and effective. And its training happens at a very larger and faster scale. The trained data of the neural network have comparably less code and more algorithms.

C. MEASURES

Based on two conditions i.e. flexibility and maintenance cost, the data has been collected by the day. Various questions like Does chatbot provides easy flexibility among various platforms? How is the maintenance cost varying for chatbot? had been asked in the survey to know the responses to respective questions. The participants were asked to choose between Yes or No and High or Low for the respective questions. In which for flexibility condition 15 male and 16 females answered yes, and remaining 7 male and 7 female answered no. For maintenance cost factor 17 females and 16 males answered low, and 6 females and 6 males answered high. A hypothetical test was done to validate the hypothesis.

VI. EXPERIMENTAL RESULT

By using the Chi-square test, calculations had been done to find the expected value of the data collected through a survey. The expected value in the flexibility factor is $E_{11}=15.15555556$, $E_{12}=6.84444444$, $E_{21}=15.84444444$, and $E_{22}=7.15555556$. By using the Chi-square formula, the Chi-square value i.e. X^2 was been calculated. So, the Chi-square value i.e. X^2 for flexibility is 0.01004079 and the significance level at 95% is 3.84 with the degree of freedom 1. For maintenance cost, the Chi-square value i.e. X^2 is 0.00808478 and the significance level at 95% is 3.84 with the degree of freedom 1.

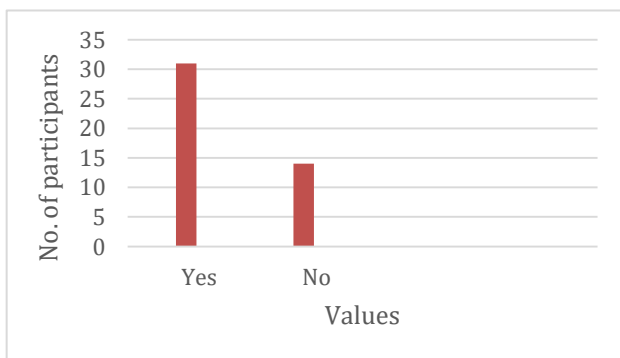


Fig.1 Flexibility among Various platforms

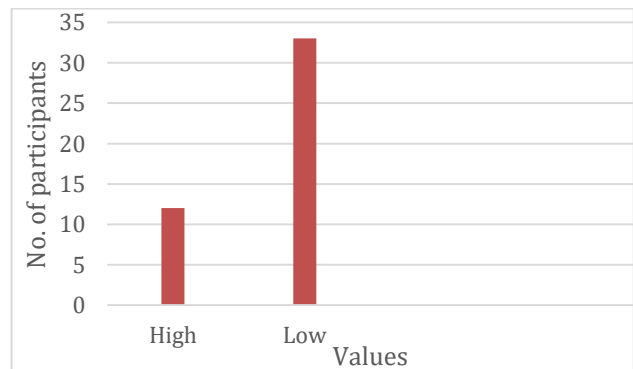


Fig.2 Maintenance Cost of Chatbot

The independent data calculated using Chi-square test with survey analysis resulted that, the participants get better flexibility and low-cost maintenance by using the Conversational AI chatbot. So, the proposed hypothesis i.e. H1 for this study gets accepted. And the chatbot also satisfies the customers requirement and provides flexibility at low cost maintenance is therefore proved.

VII. CONCLUSION

Customer satisfaction and flexibility of conversational AI chatbot is expanding day by day. Since chatbots are getting smarter by gaining new methods, they are improving user satisfaction by becoming more user-friendly and reaching their expectations to enhanced user experience. Security and privacy of data are needed to be more safe and secure while using the chatbot. So, data maintain their confidentiality. Also, the cost of maintenance is less which allows normal people to take advantage of this technology easily nowadays.

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