# *Effectiveness of chatbots in Customer Support Services*

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***Abstract - The purpose of this study is to assess how well chatbots support customer service. In order to comprehend and reply to customer inquiries, chatbots are automated conversational systems that use Natural Language Processing (NLP). The goal of this study is to determine whether chatbots boost customer satisfaction and are an effective and efficient way of customer service support. A mixed-methods strategy will be used to conduct the research, with both qualitative and quantitative data collection techniques. Customers who have engaged with chatbots for customer care support will be surveyed for the project, and the data gathered from these surveys will be examined. According to the report, chatbots are a useful tool for providing customer assistance. In particular, the report forecasts that chatbots will be able to offer round-the-clock assistance, handle many conversations at once and provide clients with individualized experiences. By providing proactive support, chatbots will also increase client retention, according to the study. The research's conclusions will help people comprehend how well chatbots support customer care. The study will give insight on the advantages and drawbacks of chatbots, as well as the customer's satisfaction with chatbots' ability to support customer service. This research tries to assess chatbots' usefulness for customer service support. To determine whether chatbots are an effective and efficient manner of customer care support and whether they enhance the customer experience, the study will employ a mixed-methods approach. The findings of this study will provide valuable insights into the use of chatbots in customer service and will contribute to the development of best practices for implementing chatbots in customer service support.***

## I. Introduction

With businesses growing day by day, it is very evident that Artificial Intelligence (AI) is very being used in customer services especially in chatbots. As far as chatbots are concerned they are virtual assistants that use AI algorithms to engage in human-like conversations with customers. They have become a popular tool for businesses looking to improve their customer support services.

Our analysis we will examine the effectiveness of AI in customer support services. Specifically, we will evaluate how chatbots have impacted customer support services for individuals using them for personal use or businesses using them for dedicated support. We will explore the benefits and limitations of AI-powered chatbots

Now there are times that people use it for personal use as well for example in ChatGPT and similar bots, therefore here we will also assess whether how these certain chatbots are being used.

## II. Application Domain

- **Banks**: Here they provide customer support services, such as balance inquiries, assistance for payments and queries regarding that, Basic FAQ's.
- **E-commerce**: Product recommendations, order tracking, and customer service inquiries.
- **University (Work Done)**: They are used in student support, as well as students use it for there academics as well
- **Academics (Easiness):** Students use it for getting assistance in reports etc. as well as finding information material for their academics.
- **Personal Use**: To get help about everyday tasks, such as scheduling appointments, setting reminders, and ordering food.
- **Research Purposes**: Chatbots are being used for research purposes to collect data, conduct surveys, and analyze user behavior.

## III. Problems

- **Language Barriers:** Chatbots face language barriers as they are not trained to understand multiple languages.

- **Bogus replies:** Chatbots can provide irrelevant or nonsensical responses if they are not trained with natural language understanding. This can be addressed by switching to human output however this makes the use for chatbot useless.

- **Not able to address personalized customer:** Chatbots can struggle to address personalized customer needs if they are not trained on a wide range of emotional scenarios. This however, can be minimized by providing more training data and improve personalization.

- **Customer emotion and intent (NLP and ML Training on emotions):** Chatbots can struggle to accurately interpret customer emotion and intent if they are not trained on natural language processing and machine learning algorithms. This can be addressed by training chatbots on emotional responses and developing more advanced algorithms to accurately interpret customer emotions.

## IV. Literature Review

| SN | Paper Name | Year | Limitation |
|---|---|---|---|
| 1 | Generative Chat Bot Implementation Using Deep Recurrent Neural Network and Natural Language Understanding | 2019 | Model does not currently use beam search algorithm to find the best possible sequence to the given input sequence |
| 2 | Algorithm inspection for Chatbot performance evaluation | 2020 | Inability to capture the human like nuances of language. |
| 3 | Classification Technique of Interviewer-Bot Result using Naïve Bayes and Phrase Reinforcement Algorithms | 2018 | Ambiguity in human language.<br>Idioms and metaphors.<br>Developing accurate language model requires large amount of training data. |
| 4 | CHATBOT: Architecture, Design, & Development | 2017 | May lead to unfair or discriminatory results. |
| 5 | Naïve bayes and entropy-based analysis and classification of humans and chatbots | 2021 | Detection time is long. |

## V. Pros and Cons

| Pros | Cons |
|---|---|
| Naive Bayes:<br>Naive Bayes is a simple and fast algorithm that can be easily implemented in a chatbot.<br>It performs well on datasets with a large number of features and can handle categorical data. It has a low computational cost and is memory-efficient. | Naive Bayes assumes that all features are independent, which is not always true in natural language processing (NLP) tasks.<br>It may not work well on datasets with highly correlated features. |
| Support Vector Machines (SVM):<br>SVMs have a high level of accuracy and can handle large datasets.<br>They can handle both linear and non-linear data. They can handle high-dimensional feature spaces and perform well on text classification tasks. | SVMs can be computationally expensive and require a lot of memory.<br>They can be sensitive to the choice of kernel function. |
| Recurrent Neural Networks (RNN):<br>RNNs are effective in handling sequential data, making them a good choice for chatbots that require context-awareness.<br>They can handle variable-length input sequences, which is important in NLP tasks. | RNNs can be computationally expensive and require a lot of memory.<br>They can suffer from the vanishing gradient problem, where the model struggles to learn long-term dependencies. |

## VI. Problem Statements

- Making a chatbot which helps students to improve or enhance their speaking English as most used language in most chatbots is English itself.

- Testing chatbots to respond appropriately provided in certain context. This includes testing for specific customer queries, identifying appropriate responses, and ensuring that the chatbot is able to provide accurate and helpful information.

## VII. Solution Statements

- According to Literature reviews, Naïve bayes classification & Reinforcement method Phrase algorithm was implemented.

- The research implemented Naïve bayes classification & Reinforcement method Phrase algorithm.

| OBJECTIVES |
|---|
| The other parameter used is NLP (Natural Language Processing) enabling computer to read & understand language used by humans. |
| To determine the customer satisfaction level with the chatbot-based customer support service, as businesses can make data-driven decisions to improve their chatbot-based customer support services and provide better experiences for their customers. |
| To identify the impact of chatbots on the response time of customer support service as provide insights into how businesses can leverage chatbots to improve the response time and efficiency of their customer support services, leading to better customer experiences and increased customer satisfaction |
| To analyse the accuracy and quality of chatbot responses in customer support service as to see how well it can perform in the above-mentioned problem points. |
| To examine the effectiveness of chatbots in handling customer queries and complaints. |

## VIII. RESEARCH QUESTIONS

1. How can chatbot technology be further developed and improved to enhance its effectiveness in customer support services?
2. How satisfied are customers with the chatbot-based customer support service?
3. How does the response time of chatbot-based customer support service compare to traditional customer support service?
4. How accurate and high-quality are the responses provided by chatbots in customer support service?

## IX. METHODOLOGY

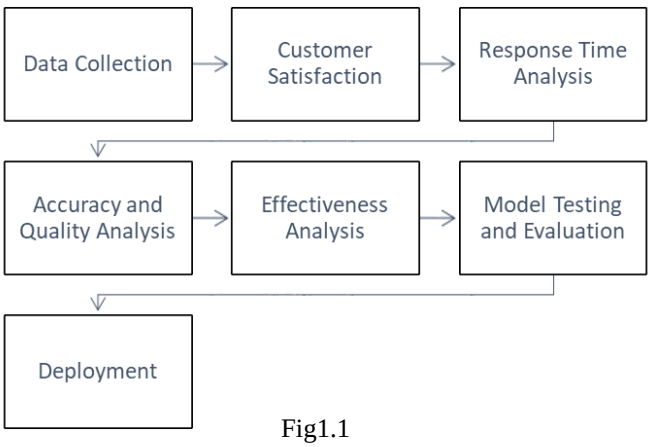


Fig1.1

According to figure 1.1, The methodology for the project encompasses several phases. It starts with data collection, where relevant and reliable data is gathered from various sources. Customer satisfaction is then measured through surveys, interviews, and sentiment analysis. Response time analysis helps identify bottlenecks in customer support. Accuracy and quality analysis assesses the effectiveness of support interactions. Effective analysis identifies underlying issues and proposes solutions. Model testing and evolution refine proposed improvements through iterative testing. Finally, deployment involves implementing changes, training the support team, and monitoring performance. Ongoing evaluation ensures continuous improvement and adaptation to customer needs.

## X. RESULTS

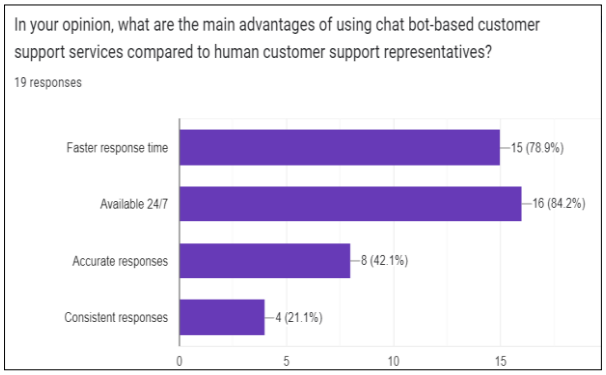


Fig2.1

As per fig 2.1, a survey was conducted to determine the level of ease a chatbot provides as a customer support service in comparison to a human. The survey received a total of 19 responses. 78.9% of the respondents said that a chatbot responds faster than a human, while 84.2% agreed that a chatbot is available at all times to respond to their queries. Furthermore, 42.1% of the respondents think that a chatbot provides accurate results, and finally, 21.1% of the respondents believe that a chatbot provides consistent responses

Based on the survey results, it is clear that a chatbot provides several benefits over a human customer support representative. One of the most notable advantages is that a chatbot can reply faster than a human, as reported by 78.9% of the respondents.

Moreover, 84.2% of respondents agreed that a chatbot is available all the time to respond to their queries. This is another significant advantage of chatbots as they can operate 24/7, which means customers can receive help outside of business hours, which can be incredibly helpful for those in different time zones or working late hours.
However, the survey also highlighted some areas where chatbots still need to improve. For instance, only 42.1% of respondents think that a chatbot provides accurate results, indicating that there is still room for improvement in terms of the accuracy of chatbot responses. Similarly, only 21.1% of

respondents believe that a chatbot gives consistent responses, which suggests that there may be some issues with chatbot training or programming that needs to be addressed.

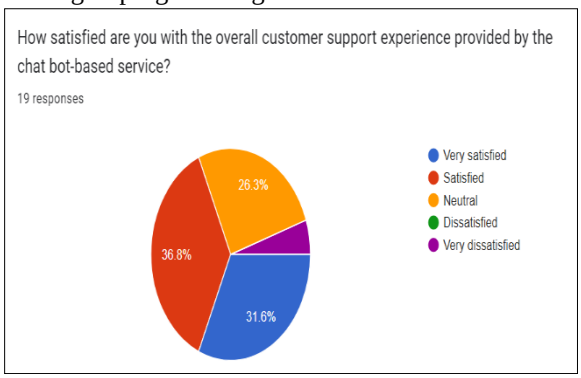


Fig2.2

The results in fig 2.2 indicate that the majority of participants 36.8% are satisfied with the overall customer support experience provided by the chatbot-based service. Additionally, a significant portion 31.6% expressed being very satisfied. However, a notable percentage 26.3% indicated a neutral stance towards their experience, while a small fraction reported being very dissatisfied.

This indicate that a majority of participants are satisfied or very satisfied with the chatbot-based customer support experience. However, a significant percentage expressed a neutral stance, while a small fraction reported being very dissatisfied. Addressing the concerns of neutral and dissatisfied users is crucial to improve the chatbot's functionality, accuracy, and ability to meet customer needs. Leveraging the strengths identified by satisfied users can optimize the chatbot-based service and provide consistent, effective support. Continuous evaluation and enhancement are essential for delivering exceptional customer support experiences.

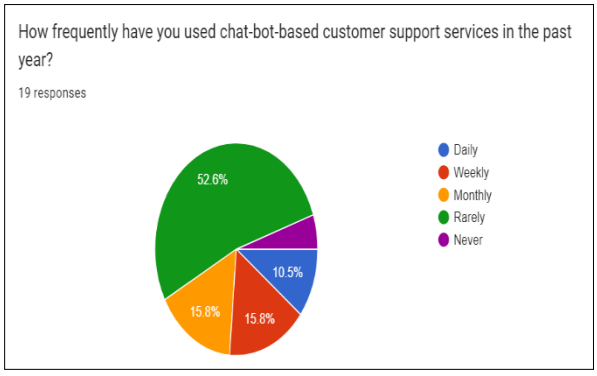


Fig2.3

As per fig 2.3 a majority of respondents 52.6% used chatbot based customer support services rarely. This suggests that they may have relied on other forms of customer support or preferred human interaction for their support needs. A significant portion of respondents 31.6% reported using chatbot based customer support services either monthly or weekly, indicating a moderate level of engagement with this support method. A smaller percentage 10.5% reported using it on a daily basis, indicating a higher reliance on chatbot-based support.

The results raise interesting points for further discussion. While chatbot-based customer support services can offer convenience and efficiency, a significant number of users still prefer alternative support channels. Possible reasons for the preference for rare usage could include concerns about the accuracy and effectiveness of chatbot responses, the desire for human interaction or the nature of the support issues faced by the respondents.

Overall, this survey highlights the diverse attitudes and behaviors surrounding chatbot-based customer support services. Further research and continuous improvement in chatbot technology could lead to enhanced user experiences and increased adoption of this support method

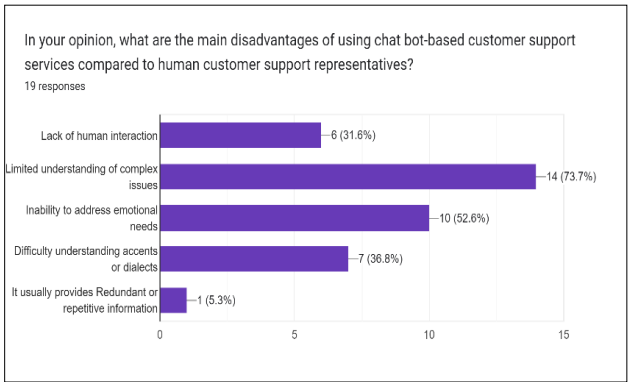


Fig2.4

The results in fig 2.4 indicate that the main disadvantages of using chatbot-based customer support services, as perceived by the participants, include limited understanding of complex issues (73.7%), inability to address emotional needs (52.6%), difficulty understanding accents or dialects (36.8%), lack of human interaction (31.6%), and occasional provision of redundant or repetitive information (5.3%).

The main disadvantages of using chatbot-based customer support services, as perceived by participants, include limited understanding of complex issues, inability to address emotional needs, difficulty understanding accents or dialects, lack of human interaction, and occasional provision of redundant or repetitive information. These limitations highlight the challenges faced by chatbots in providing in-depth assistance, personalized responses, and handling diverse language variations. Businesses should consider strategies to mitigate these drawbacks, such as integrating human oversight or providing clear escalation paths for complex or emotional issues. Continuous improvements in chatbot algorithms can also help reduce redundant or repetitive information.

## XI. Conclusion

Overall, the survey results indicate that chatbots have several advantages over human customer support representatives, including faster response times and 24/7 availability. However, there is still room for improvement in terms of the accuracy and consistency of chatbot responses. With ongoing advancements in machine learning and natural language processing technologies, we can expect

chatbots to become even more effective in the coming years, and potentially even surpass human customer support representatives in some areas.

It also indicates that the majority of participants are satisfied 36.8% or very satisfied 31.6% with the overall customer support experience provided by the chatbot-based service. However, a significant portion expressed a neutral stance 26.3%, while a small fraction reported being very dissatisfied. These results highlight the need for ongoing improvements in the chatbot's functionality, accuracy, and ability to address customer needs and concerns. By addressing the concerns of neutral and dissatisfied users, businesses can strive to enhance the overall customer support experience and achieve higher satisfaction levels. Additionally, leveraging the strengths identified by satisfied and very satisfied users can help optimize the chatbot-based service and provide consistent, effective support to customers.

It can also be concluded that the usage of chatbot based customer support services varies among individuals. The majority of respondents reported rare usage, suggesting a possible preference for other support channels. However, a considerable portion of respondents did indicate some level of engagement either on a monthly, weekly or daily basis. The usage frequency may depend on factors such as individual preferences, the complexity of the support issue and the effectiveness of the chatbot system.

This also revealed that chatbot-based customer support services have several inherent disadvantages compared to human representatives. These include limited understanding of complex issues, inability to address emotional needs, difficulty with accents or dialects, lack of human interaction, and occasional provision of redundant information. Acknowledging these limitations is crucial for businesses to implement effective strategies, such as integrating human oversight and improving chatbot algorithms, to address customer concerns and enhance the overall customer support experience. By carefully managing these disadvantages, organizations can maximize the benefits of chatbot-based services while ensuring customer satisfaction and efficient issue resolution.