Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 06, June-2021

# A Review of Chatbots in the Banking Sector

Shashank Bairy R
U. G. Student
Department of Information Science & Engineering
R V College of Engineering®
Bengaluru, India

Rashmi R
Assistant Professor
Department of Information Science and Engineering
R V College of Engineering®
Bengaluru, India

***Abstract*—Chatbot is a software application that listens to a user's query in natural language and responds accordingly. There is rapid adoption of the latest technologies in banking and chatbots are one of them. Answering customer queries and assisting customers with banking transactions are some of the ways in which it's making an impact on the industry. This paper discusses the anatomy of chatbots and its applications in the banking sector. Improvements to current chatbot technologies are also suggested.**

***Keywords— Chatbot; natural language processing; banking; banking chatbot.***

## I. INTRODUCTION

Industries are forced to evolve and update their practices due to technological advances and the contemporary market. Banking sector is one of the most developed sectors and is always looking for the latest technological solutions that improve its efficiency.

Netbanking websites are complex and involve navigating through a lot of pages to find the information you need. Bank staff undergo a lot of stressful situations when communicating with clients directly. Such situations can be avoided gracefully by using chatbots.

Only 32% of companies in the finance industry currently use AI chatbots, and 37% are planning to start using them within 18 months said a report from Salesforce. This results in a potential growth rate of 118% which indicates the demand in the industry [1].

A smart chatbot takes a query from the user in natural language and gives the appropriate response for the same. This paper aims to discuss the relevance of chatbot in the banking sector and explore how chatbots can be implemented using natural language processing techniques that can be used in the banking industry.

## II. ANATOMY OF A CHATBOT

[2] gives an overview of chatbot technology. It says that a chatbot consists of the following components:

*1) User Interface:* It is used to take input query from the user.

*2) User message analysis component:* It parses the user input message to infer the intent and extract the associated entities.

*3) Dialogue Manager:* The context of a conversation is kept and updated by it using which it decides the action to be taken for the user input.

*4) Data sources:* It includes the data of interest taken from various data sources, which can be present within a database, known as the knowledge base of the chatbot or external resources that can be accessed through API calls.

*5) Response generator:* It prepares responses in natural language which are sent to the user. This is primarily based on the intent and context information returned from the user message analysis component.

Fig 1 shows the different components present in the chatbot [2].

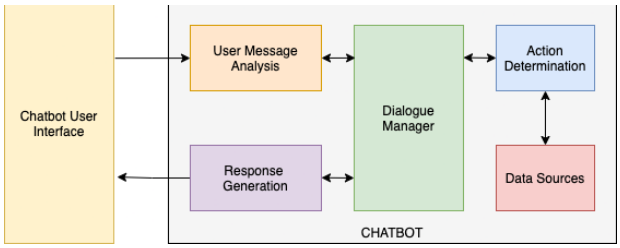


Fig 1: Components of a Chatbot (Adamopoulou & Moussiades, 2020).

User interface consists of the mobile application or web page through which the user can interact with the chatbot. The user interface must be simple and pleasant for the user to interact with to have a smooth experience.

The user message analysis involves intent identification and information extraction. Intent identification involves classifying the purpose of the user's message into one of N predefined redirection options. Information extraction requires sentence to be broken down into tokens that represent each of its component parts: words, punctuation marks, numbers, etc. These tokens can be analyzed using a number of natural language processing techniques like Bag of Words, Latent Semantic Analysis, Regular Expressions, Part of Speech (POS) Tagging, Named/Relation Entity Recognition, Semantic Role Labeling and Creation of Grammatical Data Structures. [3]

The dialogue manager stores and updates the conversation's context. It includes current intent, identified entities, or missing entities required to fulfill the requests from the user. Missing information, processing clarifications by users and asking follow-up questions are done by the dialogue manager [2]. The dialogue manager is tasked with selecting the correct communication strategy and delivering the message after applying language tricks like switching topics, asking open questions and eliciting more information from the user to make it seem human [3].

In response generation, a structured representation of the user's message which conveys data about who is speaking, the dialogue history, and the context is used to generate the response [2] using one among pattern based, retrieval based,

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 06, June-2021

and generative models [4]. The pattern based model generates the response by using templates based on a set of predefined rules. The retrieval based model is more flexible and queries and fetches the required data using API's and generates responses for user's input. The generative models can generate responses based on current user messages and previous messages. This approach requires large amounts of training data and is difficult to train. Therefore, generative models are seldom used [4].

The above components of the chatbot work together to interact with users and answer their queries.

## III. CHATBOTS IN BANKING

Digital banking is being automated currently as it frees up the employees to concentrate on more complex inquiries. Banks are able to automate their customer interactions through chatbots. In a survey conducted by Humley, two-thirds of those surveyed felt that an AI-powered chatbot would be useful in assisting them and 44% would rather communicate with a chatbot than a real person to get their queries answered [5]. According to a research conducted in [6], chatbots can save banks 4 minutes per enquiry, equating to average cost savings in the range of $0.50-$0.70 per interaction. It also forecasts that the success rate of bot interactions in the banking sector to reach 90% by 2022.

[7] explores the services provided by chatbots in Indian banking sector. HDFC Bank and State Bank of India use chatbots to clear all general queries of customers. ICICI Bank uses chatbot to clear general queries, pay bills, transfer funds and recharge. Chatbot provided by Yes Bank can be used to check balance, view recent transactions, send money, pay bills and much more.

A good implementation of a chatbot can bring several benefits to the banking sector such as:

*6) 24x7 customer service availability:* The chatbot is available 24x7 to answer customer's questions. This means customers can get their questions answered even during weekends which leads to better customer experience [8].

*7) Increases productivity of bank personnel:* Chatbots can solve minor issues of the customer enabling the bank personnel to deal with major issues and saving their time [8]. In [9], it is seen that Swedbank's chatbot Nina enabled the bank personnel to spend their time on other types of calls while it handled all the service calls.

*8) Track spending and schedule payment:* Bank of America's chatbot Erica assists customers with paying down debt, checking account status and getting credit score insights [9]. This helps people in keeping track of their expenditures and making sound decisions to stay debt-free.

*9) Assist employees:* Chatbots not only serve customers but can also be used to assist employees. They can be used to schedule meetings, send messages between employees and much more. SEB rolled out a chatbot named Amelia which assists the employees with internal IT support [9].

*10) Personalized marketing:* Chatbots can be used to suggest personalized investment options and offers using customer's data thereby increasing the conversion rate. ImaginBank's chatbot Gina uses the user's location, preferences and interests to offer promotions [10].

## IV. IMPROVEMENTS TO CHATBOT SYSTEM

This section discusses the ways in which improvements can be made to the chatbot in order to be more effective.

[11] conducted a study on improving chatbot conversations by doing a manual analysis of the conversations. To improve the prediction of existing intents, using more and better training data was suggested. It also advised, if an entity was used in a sentence like a phone number or account number, the chatbot should also be able to search it's backend for the entity without starting with general intent and ask clarifying questions to give a personalized and precise answer. It was noted that when using button responses to interact with the chatbot, proper phrasing of the text within the buttons should be used. False positive cases of intent prediction can be prevented by improving the training data.

User initiated dialogues are error prone because users can say anything they want. To tackle this issue without making the conversation lengthy [12] suggests using implicit confirmations where the user's input is used in the following system output and extra information is added to it. For example, when the user wants to transfer ₹10000, the chatbot can say "So you want to transfer ₹10000. What mode do you want to use to transfer the amount?" In this way, the user will be able to identify and correct the chatbot if it didn't recognise the user's intent correctly.

[12] also explores the possibility of adding personalization to the chatbot. It says the majority of personalization systems are designed to enhance productivity, because people want to achieve a specific goal by using these systems. This statement is very correct with respect to the banking sector. Therefore, usage pattern recognition of the user, personalized searching and personalized marketing of services are some ways which can be used to increase the productivity for the user. Creating a pleasant user space for the user by designing the chatbot in order to meet the user's needs is also very important. This comes under the domain of architectural personalization. The arrangement and design of digital artefacts should be given importance as it impacts the user's interaction with the chatbot.

In a study done by Infosys, handling security issues and fraud detection was discussed. To handle these issues, it was advised to use information from external parties providing anti-money laundering, identity verification and voice identification technologies that can be integrated into the chatbot using the APIs. This helps the banks to meet its security and regulatory requirements. [13]

## V. CONCLUSION

Chatbots are being adopted in the banking sector at a very fast rate. They are not only being used for answering customer's questions but also for providing a wide range of services which include bill payment, fund transfer, view recent transactions and much more. Chatbots are also getting smarter due to integration of natural language processing and machine learning. By helping customers round the clock, they help banking staff focus on other important tasks. Therefore, we can say that chatbots have become an essential part of the banking system.

In this paper we have discussed the role chatbots play in the banking sector, the anatomy of chatbots and advantages of using chatbots in the banking sector. We also went over the

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 06, June-2021

improvements that can be made to the chatbot to serve customers better. Therefore, we can conclude that the role chatbot plays in the banking sector will only continue to rise due to constant improvements being made to its logic and the increased demand for a better customer experience.

## REFERENCES

[1] Salesforce Research. 2019. "State Of Service Report, Third Edition". https://c1.sfdcstatic.com/content/dam/web/en_us/www/documents/reports/salesforce-research-third-edition-state-of-service.pdf.

[2] Adamopoulou, Eleni, and Lefteris Moussiades. "An overview of chatbot technology." In IFIP International Conference on Artificial Intelligence Applications and Innovations, pp. 373-383. Springer, Cham, 2020.

[3] Cahn, Jack. "CHATBOT: Architecture, design, & development." University of Pennsylvania School of Engineering and Applied Science Department of Computer and Information Science (2017).

[4] Hien, Ho Thao, Pham-Nguyen Cuong, Le Nguyen Hoai Nam, Ho Le Thi Kim Nhung, and Le Dinh Thang. "Intelligent assistants in higher-education environments: the FIT-EBot, a chatbot for administrative and learning support." In Proceedings of the ninth international symposium on information and communication technology, pp. 69-76. 2018.

[5] Waterman, Chinia. 2018. "Consumer Online Banking Trends 2018". Humley. https://humleyai.com/2018/09/18/consumer-online-banking-trends-2018/.

[6] "Chatbots, A Game Changer For Banking & Healthcare, Saving $8 Billion Annually By 2022". 2017. Juniperresearch.Com. https://www.juniperresearch.com/press/chatbots-a-game-changer-for-banking-healthcare.

[7] Pal, Singh Netra, and Devender Singh. "Chatbots and virtual assistant in Indian banks." Industrija 47, no. 4 (2019): 75-101.

[8] Roznovsky, Alexander. 2020. "Chatbots In Banking Sector: Benefits, Examples, And Future". Light-It.Net. https://light-it.net/blog/chatbots-in-banking-industry-benefits-forecasts-and-more/.

[9] Morgan, Blake. 2017. "5 Ways Chatbots Can Improve Customer Experience In Banking". Forbes. https://www.forbes.com/sites/blakemorgan/2017/08/06/5-ways-chatbots-can-improve-customer-experience-in-banking/.

[10] R, Daria. 2018. "7 Reasons To Create An AI Chatbot For A Banking App". Rubygarage.Org. https://rubygarage.org/blog/chatbots-in-banking-apps.

[11] Følstad, Asbjørn. "Improving Conversations: Lessons Learnt from Manual Analysis of Chatbot Dialogues." In Chatbot Research and Design: Third International Workshop, CONVERSATIONS 2019, Amsterdam, The Netherlands, November 19–20, 2019, Revised Selected Papers, vol. 11970, p. 187. Springer Nature, 2020.

[12] Duijst, Daniëlle. "Can we improve the user experience of chatbots with personalisation." Master's thesis. University of Amsterdam (2017).

[13] Infosys. 2019. "Power Of Conversational Banking: Best Practices For Chatbots". https://www.infosys.com/about/knowledge-institute/insights/documents/conversational-banking.pdf.