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Banking Chatbots: How Artificial Intelligence Helps the Banks

Ionuț-Alexandru CÎMPEANU*
Bucharest University of Economic Studies, Bucharest, Romania
**Corresponding author, ionut.cimpeanu@csie.ase.ro*

Denis-Alexandru DRAGOMIR
Bucharest University of Economic Studies, Bucharest, Romania
denis.alexandru97@gmail.com

Răzvan Daniel ZOTA
Bucharest University of Economic Studies, Bucharest, Romania
zota@ase.ro

Abstract. *When we speak of solutions that can be designed, developed, and implemented to solve a determined problem in a specific domain, human intelligence shows that it cannot be kept within regular bounds. In addition, it consistently manages to produce innovative elements that increase efficiency, applicability, and abstraction, with the drawback of increasing the overall underlying complexity. As technology advanced and time passed, in every system there was a visible need to automate manual, repetitive, and mundane tasks to help save time and let humans focus on more important things. A practical example of such a system is the banking system. In this paper, our aim is to present how Artificial Intelligence (AI) helps this field through the use of chatbots. In this sense, we present and analyse five examples of such applications that are already used in the international banking system, highlighting the main benefits they bring. Finally, we present some conclusions regarding the chatbot systems analysed, acknowledging that the future will increasingly belong to IT applications of this kind.*

Keywords: Finance, Artificial Intelligence, Chatbots, Software, Banking

Introduction

According to the latest writings in history books, humans in the last decades and centuries have made outstanding technological improvements and advances, developing the environment by implementing a lot of industrial standards and qualities. This, in turn, has led to products and services that were designed to help achieve prosperity and circumstances that had never seen before. However, the latter, which are supposed to help the system within which they operate, could not hide the fact that they introduced unnecessary complexity to it.

In the present, as things have evolved even more, the ambition and desire for a scalable and developed system must consider the complete inclusion and exhaustive understanding of the surrounding environment. Therefore, new functionality, adjuvants, products, and services were designed and constructed to facilitate the implementation process and ensure that they do not face other impediments than imagination (*we have all the workforce and raw materials to build impressive things, but what are the things we are building?*) and material related (*we have innumerable desires and needs, but we live in a world where the resources are not countless*). And so, one pertinent example of such improvement and enhancement is **Artificial Intelligence** (AI), which is a well-known and well-disputed concept, its main objective being the switch from manual labour to a more automated one.

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As for the way of action, here are some relevant concepts and examples to better understand what the former can do:

- **Object recognition** represents the action of identifying a specific object (or a specific entity) from a collection present in a picture. As an example, consider finding a smartphone on the table with many electronic devices.
- **Entity recognition --** some sort of object recognition, but it is used with digital text as input and outputs relevant information.
- **Clustering,** the process of collecting the data from a single 'source of truth' and creating groups based on various aspects or data points.
- **Natural language understanding** (NLP) -- converting words into complex structures that can be understood by any machine.
- **Chatbots –** represent programs made by humans, specially constructed to interact with, well, humans. They can be programmed to express human-like behaviour, such as basic communication, providing information, and responding to questions. Given the nature of their implementation, they continually learn using complex and branched algorithms.
- **Summarization** is the ignorance of redundancy and randomness, storing essential information.

The subject we are going to tackle in this paper is the chatbot. They are automated delegates that are meant to interact and communicate with human beings. Along with their base version, they also possess functionality whose main purpose is to make the user experience more immersive.

We are going to make an analysis in the context of banking, or better said, the digital variation of it. Thus, we will begin by providing useful information from the literature that we studied, both physical and digital, and then we will describe the methods used to conduct research. In the next section, we will analyse five chatbots, giving them the spotlight and describing their capabilities (weaknesses and strengths). Finally, we will reiterate what was stated in this paper and see how artificial intelligence is influencing the domain that we chose to study.

Literature review

Artificial intelligence has been around for some time. It was first designed and conceptualized back in 1955 as a part of computer science and concentrated on constructing intelligent machines; in other words, computers that could mimic the abilities of the human mind, such as the capacity to solve problems using rational thinking and continuous learning. Around the world, many enterprises and organizations are spending billions and billions of dollars to help fund the research and prototypes designed using artificial intelligence; that is, hoping that we can solve real-world problems that our current technology is not capable of doing.

When we are talking about the banking system, according to the specialty literature, many artificial intelligence applications can be integrated into it. Among them, we have:

1. **Customer service or engagement**, provided by a chatbot => these are one of the most used applications across all industries because of their return on investment in cost savings. In the banking domain, they can tackle various tasks, such as accessing mini-statements, transfers, and balance enquiries.
2. **Robo advice =>** the process of understanding the financial situation by analyzing data they share, as well as their history on the topic. On the basis of these data, the robot advisor will be able to give pertinent recommendations in a particular field.

3. **Predictive analytics =>** uses the capabilities of natural language understanding which are exhibited by artificial intelligence machines; so, AI can detect patterns and correlations in specific data, which can lead to different opportunities.
4. **Cybersecurity =>** artificial intelligence can improve the security of systems by learning from previous attacks and threats, but it can also supervise internal breaches and propose different actions for correction.
5. **Credit scoring or direct lending =>** artificial intelligence can be used to detect he was a specific customer or client is worthy of receiving a specific credit based on a wide range of non-traditional and traditional data which is analysed. This can help the credit scoring model become more robust, even for individuals or entities with a limited credit history. (Dumasia, 2021)

It should be noted from the literature that artificial intelligence is also strengthening the competitiveness of banks through the following actions.

- **Enhanced customer experience: Based** on previous data, AI develops a better understanding of customers and their behaviour.
- **Prediction of future outcomes and trends**
- **Cognitive process automation:** this can help in securing return on investment and reducing costs
- **Effective decision-making --** these systems think and respond like humans
- **Robotic automation of processes --** this enables automation of at most 80% of repetitive work processes, allowing users to give more time to tasks that matter and require more manual work. (Wipro, 2022)

Methodology

In our research activity, we thought of using a variety of methods that are based on qualitative research, but also mixed methods that are based on both the observation and analysis of the identified information, as well as the implementation of intelligent solutions by following the steps and making exactly the observed patterns. Both individually and in a team, through collaboration, we searched for information and identified chatbot models implemented in different fields of activity at national, European, and global levels, following with priority the originality of each intelligent solution and being interested in the transformation made by each developer so that the chatbot to be used by several users, to have additional options, capacity to expand, and to implement new functionalities, to be used in as many sectors of activity as possible.

We searched and identified on-line platforms used in banking both in Romania and in Europe or worldwide, platforms that also contain international projects that serve smaller groups or large communities of people. Reading articles and studying sites that contain information about these online platforms helps us understand how IT specialists who build and develop intelligent IT solutions think and manage to find professional collaboration partners. We have noticed that platforms have such articles in their databases that are a starting point in thinking about the application. These articles are written with great professionalism, and the communication language is made starting from a few foreign languages and reaching a multitude of foreign languages depending on the level of interest of the users.

In our approach, we used several methods that are part of qualitative research. These are:

- case study
- participant observation
- focus on the group

- the thematic study of the documents

Thus, using the case study, we collaborated by dividing our tasks and documenting on the Internet about intelligent platforms and applications in banking, how different IT solutions were implemented, and looking for the countries that applied the most in the field of artificial intelligence. We followed the impact that these solutions had on the activity in which they were implemented. I searched and watched videos where online banking platforms are presented, with priority watching banking platforms that have also implemented chatbot solutions. I attended courses where the functionality of these platforms was explained and analysed. I have read magazines and books about the functionality of smart apps on these platforms. Careful research of these online platforms that also had a chatbot integrated helped us understand the benefits that bank users get when banking through a chatbot. In this research, we have described five such chatbot models used in banking, saying for each intelligent solution what benefits it brings for users, what additional options are integrated and what are the benefits for firms/companies that implement such solutions both locally and nationally or globally.

Focus on the group is the qualitative method through which we collaborated. So, we exchanged ideas and knowledge, we supported each other within the team by permanently establishing each one's tasks and the objectives we pursue in this research, we paid attention to the chosen research topic and its applicability in the banking field, but also in different fields of activity. The three team members contributed equally to the research process by producing their ideas and complementing the work of others when appropriate.

Participant observation consisted of Zoom meetings between team members, but also face-to-face meetings and discussions to debate and exchange ideas and experiences related to the research topic. This method was also used in meetings with the guidance committee of the Doctoral School of Economic Informatics, with fellow doctoral students, and also with other professors from the ASE University Bucharest. I also had discussions on this research topic with senior colleagues in the field in which I work, exchanged views and opinions, and took valuable information for our research work, especially from the chatbot models that some senior colleagues have developed or currently work on.

The thematic study of the documents consisted of studying specialized articles and magazines, watching videos and tutorials in the field, going through courses where the steps to create a chatbot using different programming languages are presented, studying books about chatbots and platforms that have integrated a chatbot, especially in banking, but also additional options that the developers have integrated to obtain more benefits. The entire team also studied different user guides for the platforms and the chatbot that is integrated with the respective platforms. We have sorted all the collected materials in such a way that they will help us both in this research and in putting this information into practice by creating, at the end of the three years of doctoral studies, a platform and a chatbot integrated with the platform.

I. Five chatbot models implemented in banks

I.I. Ceba

CommBank(CBA) is an Australian bank that offers numerous services to customers. These services include private investments, various types of insurance, pensions, fund management services, and loans. The bank has offices in the USA, Australia, Asia, and part of Europe.

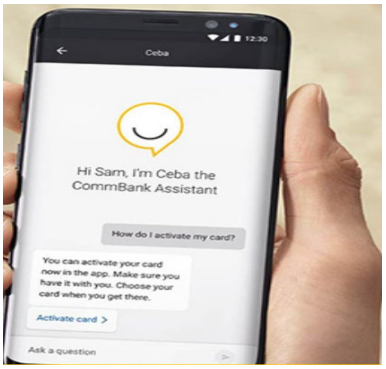


Figure I.I.I. Ceba Chatbot
Source: https://www.commbank.com.au/support/ceba.html

For greater efficiency and multiple benefits, CBA has developed and implemented a banking chatbot, an intelligent interoperable solution to inform customers by answering their banking questions and easing the work of bank clerks (Cummis, 2022). The chatbot is a virtual assistant that is available both on the mobile application and on the bank's website. The chatbot's name is Ceba and its knowledge base helps it to respond to daily challenges in the bank. It is a text chatbot. This means that text messages are used in customer dialogue. The chatbot is available at any time and from any place, the only condition being an internet connection. An option that many chatbot models do not have is the connection that a person can have with another person through a smart application. This option is called: Connect with a human. Through this option, each person using the chatbot receives a message when it is the right time to chat with another person. The Ceba chatbot needs some data from the person who intends to use this option by providing the chatbot with their phone number to be easily contacted. When a person is called by another person through the chatbot, the call is tracked and a call database is created where it is easy to see who is calling and who is being called, the type of information being discussed, and the quality of the information (Bank, 2018). Also, with the help of the chatbot, you can leave a message for the people you want to talk to. The chatbot also has a notification option that sends each user the information they need using the user's past conversations and search history.

This chatbot can provide information about the banking operations that each user can do online and guide customers by providing support and assistance with any banking issue. When the chatbot cannot find the information in the database to answer the customer's request, it connects that person to another person via text or phone (CommBank, 2022). It does this only after identifying the right person for each user according to their needs and problems. There are two ways to communicate with Ceba. One way is from your phone in the CommBank app. This application must be downloaded and installed on the user's phone to be able to contact Ceba. Once in the application, the user benefits from all the options of the chatbot. Another way to contact the chatbot is from your PC by installing the NetBank app. Regardless of which way of connecting with the chatbot the user chooses, the information stored in the database and all dialogues conducted with Ceba or through it with other people are confidential.

I.II. Citi Bot SG

Citibank is an American bank with offices in the United States, India, Mexico, and Europe. In 2004, it also established headquarters in Singapore due to the requests of individuals and also of

the activities taking shape in small businesses. International companies began to develop by offering services that were only available in larger banks.

To improve the relationship with customers and to be in the trend of novelties in the field of artificial intelligence, the bank develops and implements an intelligent solution through which users interact with each other and with the chatbot. Users can get insights through messaging by conversing with both Citi Bot SG and competent people who have valuable information related to their issue through the chatbot (Inc., Citi Releases Its First Citi Bot SG on Facebook Messenger in Singapore, 2018). This chatbot is a text-based version that uses written messages to dialogue with the user. It is possible to obtain information related to the balance of the account, the transactions made, the payments to be made, the debts the user has with the bank, the status of the account in the bank, and the amount the user has in the account. The chatbot also has information about card payments and can send notifications to users after each transaction. The user can receive information in the form of notifications from the chatbot with the due date of financial debt, and the person concerned is notified of the amount to be paid.

The chatbot is available on Facebook Messenger. Thanks to the large community of people who use this smart app, constant improvements can be made, and the chatbot database is constantly being transformed. The chatbot learns automatically and constantly, and gets better at conversing with customers. It is based on NLP, being able to perform additional activities that respond to the needs of the bank's customers, such as: sending credit card invoices, checking the balance of the account, offering rewards, checking debts, offering gift points when the user makes more transactions and conducts more banking operations (Inc., Citi Launches First Facebook Messenger Banking Chatbot in Singapore That Provides Customer Account Information, 2017). Among the benefits of using the Citi Bot SG, is the chatbot is: offering customers innovative digital lending solutions that help them in their economic activities or their activities, creating partnerships between firms/companies that interact with the help of the chatbot and collaborating to obtain benefits and profit, increasing the number of bank customers, increasing people's confidence in using the chatbot, providing valid and reliable information in the economic field needed by the user.

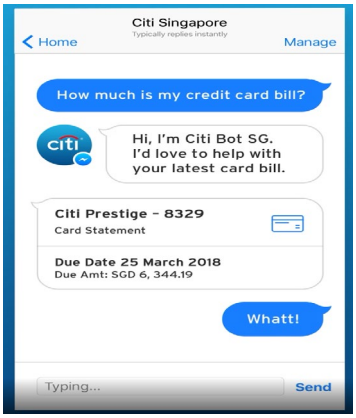


Figure I.II.I. Citi Bot SG

Source: https://www.wearefreeflow.com/portfolios/digital-campaigns/citi-bot-sg-fb-messenger-launch-campaign/

This initiative of the bank to implement the chatbot and increase the number of partnerships locally and even globally will have multiple benefits for Citi Singapore, but also for the US-based bank, thereby achieving advertising using artificial intelligence in the service of the people. The bank's strategy is to be present everywhere where customers need, where they work, and where

they live. Everything is done with the help of the chatbot. Using NLP, the chatbot works pleasantly, is easy to understand, and the conversation it leads is similar to a human conversation (Mejia, 2019). Other options the chatbot has include blocking or unblocking credit cards, notifications alerting the user when another person has accessed the card, security alerts, card activation, and increased bank user security through passwords and SMS on personal phones.

I.III. Ally Bank Bot

Ally Bank is a direct bank in the United States that offers a direct approach to banking with no minimum deposit required to open an account, live customer service, and no monthly fees. It is also a direct banking subsidiary of Ally Financial Group, and to further develop and expand its mobile banking application, it has incorporated a visual assistant named Ally Assist that is responsible for providing a more customizable and intuitive banking experience to the final user. Among others, the chatbot can:

- help to pay the bills, transactions, and deposits and initiate various transfers
- help in requesting information on different accounts and transactions
- obtaining formation on interest earned by analysing saving and or spending patterns
- help users to evaluate their bank account in a meaningful way and better administer their finances.

In addition to what was stated above, Ally Assist can also make informed guesses on customer needs based on account and transaction analysis, thus leading to better messages and context-aware topics delivered to the customers. (Ally, 2021)

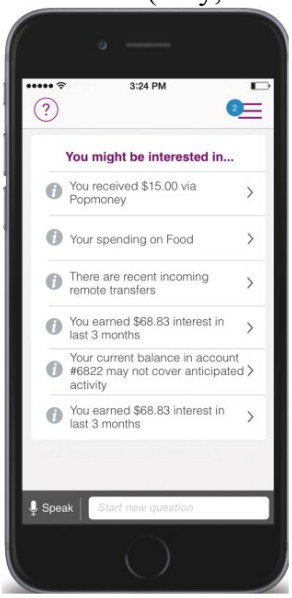


Figure I.III.I. Ally Bank Bot
Source: https://www.chatbotguide.org/ally-bank-bot

According to Diane Morais, president and chief officer of Ally Bank: "As *clients adapt in a rapid way to the mobile environment, they are also becoming more accustomed to applications that communicate to them through auditory input. Given that statement, rain forced by our focus on offering new capabilities that we believe will enhance and improve the overall banking experience, we are introducing this application named Ally Assist to enable customers to better customize their accounts in a convenient and easy-to-use way*."

By fully utilizing artificial intelligence and custom data profiles, the application can anticipate customer needs and approach them with pertinent solutions. The system learns from interactions and transactional behaviour to decide to which degree the provided information is relevant. As an example, it can propose distinct aspects in which users might be interested, such as the date and amount of a recent transaction.

As Carrie Sumlin, who is the Digital Deposits executive, said: "*we are aware that half of our customers are using mobile access to their accounts and so, mobile logins represent more than a third of our longings in our application. this, rainforest by the ability and the commodity of using voice commands can represent the powerful weapon in managing your financial information."*

By speaking or using the inbuilt keyboard to type, customers can receive a prompt and automated response. For example, they can use the application to calculate how much they have spent or deposited in all their accounts: typing or saying 'how much did I spend in a specific month" will produce a computer response and then a list of specific transactions performed during that time. Also, the chatbot will help the user understand his or her actions in greater detail. As an example, when the customer does not recognise the name of a specific merchant, Ally Assist will help them do that.

Now, the application is available only on iPhone and iPad, with only several languages to choose from, English, Spanish, and Portuguese. (Barris, 2022)

I.IV. Clari

Clari represents a chatbot that is accessible within the TD (Toronto-Dominion) banking application. It can produce quick responses to client questions when it comes to banking and provide help with many common account-related actions. Concretely, the chatbot is capable of:

- answer a myriad of questions related to TD bank accounts, such as spending preferences and balances
- give granularity to transactions, separating their intrinsic information into specific categories, thus allowing the clients to get a better comprehension of spending habits and where they are giving away their money
- sending money
- paying bills
- finding TD locations in proximity
- see spending history - up to six months (Clari, 2021)

To ensure flawless operation and to provide the functionalities described above, the chatbot constantly analyses and uses information in the background. It also learns from the questions addressed and the language that final users are utilizing while communicating, to improve their conversational abilities. In other words, the Clari chatbot is constantly learning and improving in assisting clients to fulfill their needs. (TD, 2021)

But, as we already know, this comes with a cost. Conversations will be automatically recorded and stored by the application, so the user must give their consent to data processing. More than that, once the application is closed, the ongoing chat will no longer be available. (TD, 2022)

From general to more concrete questions, Clari can respond when asked:

- show me the last transaction I made
- show me a specific transaction related to this field (food, gas, etc.)
- show me how much I have spent on this specific day
- show me my balance

- show me how much money I owe on my accounts

At the moment, the application is available on smartphones and tablets and, to be eligible for it, you must have a TD Canadian dollar account. Business accounts are not allowed.

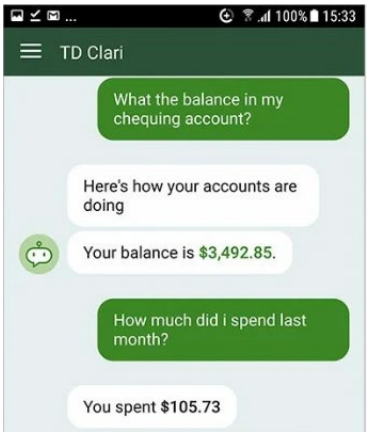


Figure I.IV.I. TD Clari

Source: https://play.google.com/store/apps/details?id=com.td

I.V. Eno

Being available on the bank's mobile application, website or SMS, Eno, the digital assistant from Capital One Bank digital assistant, uses complex natural language understanding and processing to understand more than two thousand ways someone might ask for their balance.

Furthermore, the chatbot is also capable of signaling if the value of a bill is higher than normal, suspecting fraud attempts and detecting high tips. A unique capability of it is that it can monitor free trials and remind customers when they end. It manages to make customer accounts more accessible and secure through the following.

- It lets them know about any unusual or suspicious charges that are spotted on their accounts and can guide them to a resolution. As they say: 'With *just a few steps, you, as a user, can stop fraudulent and suspicious activity on your account. By adding your phone number, you register to automatically get alerts. So, if you do not recognize a specific charge sent through a notification, you can respond with '**no**' and your card will be blocked so no further charges can be made. After that, you can contact customer service to request a replacement card*".
- It creates merchant-specific virtual card numbers to use while shopping online, which helps protect the credit card account from fraud. Virtual card numbers are still linked to the same credit card account. But, when shopping online, the user's actual card numbers are not shared with the respective sites, adding an extra layer of security through an intermediary. That means that, if a site is compromised, there is less chance that the virtual card used on it will be used anywhere else. But, of course, any functionality has its advantages and disadvantages. If the user plans to pick up the product in person, card verification will fail because the numbers will not match. This limitation can apply to hotel reservations and will-call tickets, as well.
- It notices when a specific user has two charges for the same amount, from the same place and on the same day, sending notifications and guidance to solve the problem.
- Of card lock – if you lose your card by mistake, it can lock its transaction capability.
- It can monitor transactions.

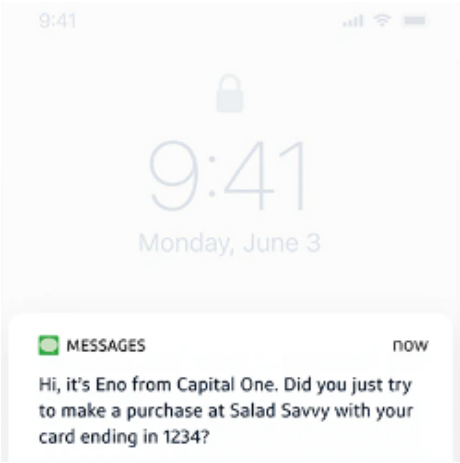


Figure I.V.I. Eno

Source: https://www.capitalone.com/digital/eno/

II. The benefits of chatbots in banking

The benefits of the five banking chatbot models described in this article are:

• *Advanced communication*

Customers ask questions and get answers easily and quickly, find out information about bank accounts, about the transactions they want to make without having to go to the bank premises, they can make transactions without a bank employee getting involved in this activity. These things bring some benefits to both banks and customers as time is saved. At the same time, we can talk about the fact that all bank customers who use the chatbot receive correct answers to the questions they ask the chatbot. We are talking about satisfied customers, who will return to the bank and use the bank's services easily and quickly through the options implemented in the chatbot. And the bank saves a lot of time and the money that would have been spent on services will now be directed to other investments and profit.

• *24/7 support*

The five banking chatbots can answer the customer's questions at any time. They are accessible from anywhere, anytime, the only condition being the internet connection. These things are of real use especially when customers need help and banks are out of business hours. The chatbot assists and guides the customer so that he can solve his problem, whether it is related to accessing the account, losing the password, how to make a transaction or information about the bank's working hours and branches close to the customer's home.

• *Increased speed of transactions*

The chatbot can complete a transaction in seconds. Thus, customers who want to carry out various transactions through the chatbot will receive the answer instantly or in a few seconds and the business will have a much shorter completion time. The long queues that bank customers used to make at the bank or ATM get rid of, and the hours of waiting for the interaction with a bank employee to solve a banking problem also disappear.

• *Improved customer satisfaction*

By quickly solving customer needs, the chatbot makes them trust the bank and want to do more transactions seeing that they are done easily. Customer issues are resolved 24/7 by the chatbot, and explanations given are clear, quick, and to the point. When the chatbot does not find a complete answer to the customer's question, it will initiate a phone call to a bank employee who will take over the customer's problem.

Conclusion

This article aims to highlight the importance of artificial intelligence in banking. In recent years, it has been seen how the financial field is starting to depend increasingly on smart applications. These applications take over a large part of the professional duties of the employees, making their work easier and effectively contributing to solving the more difficult tasks in firms and companies; they enable the interaction of employees with each other and the solving of professional tasks in a brief time. In the coming years, artificial intelligence is expected to contribute increasingly to the development of the banking sector, with most companies agreeing to adopt and implement intelligent solutions.

The paper presents five chatbot models implemented in banking and the advantages these models bring to both companies and customers. The digital transformation of internal operations and the services that the bank offers customers facilitates customer/bank communication and reduces the time required to conduct these operations. In each case presented, the chatbot communicates with the client, providing him with the necessary information, and guiding him in solving the problem. Through additional options implemented in the smart app, the chatbot can directly contact the customer to provide them with information that the chatbot cannot yet provide. From all dialogues with customers and employees, the chatbot is constantly learning and developing its knowledge base to be able to provide better and more complete answers in future dialogues.

The five chatbot examples described in the paper can communicate with the customer both on the online platform and in the mobile application, the only thing required is an Internet connection. The developers of the five models provide quality services by:

- protecting customers through the security of their data and the information they provide in dialogues with the chatbot
- the confidentiality of written messages containing personal data
- the quality of information made available to users
- how the chatbot helps the bank's customers solve problems by giving them confidence in the technology
- increasing the number of bank customers.

The reliance on artificial intelligence in the banking sector, but also in other sectors of activity, leads to the transformation of the workforce and the rethinking of the interaction between customers and the company that provides services. There is an upward trend for the mass adoption of technologies in the banking sector. Several more powerful chatbot models have appeared that can provide information in any field. Among them, we mention ChatGPT (OpenAI) and Bard (Google). These two chatbot models can also be used in banking by providing the correct information to users, and the above chatbots can be easily integrated into a banking system to provide more complex information.

We address this topic in this article because we believe that applications of artificial intelligence in various fields of modern society are extremely important both now and in the future. Also, this research in the field of chatbots helps us considering that in the near future we propose to build such an integrated system within a web portal.

In conclusion, we believe that in the future there will be a major differentiation between companies that implement AI and understand its importance in the field and companies that will not apply this technology. Most likely, the latter will have fewer and fewer customers and will disappear from the market by not adapting to the needs of a modern society. The future of chatbots in banking will be reflected in diversified responses of robots that will no longer necessarily follow

standards or templates and that will learn progressively and automatically, taking over more and more of human behaviour and language.

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