

The Chatbots and Their Role in the Progress of Society

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In this article, we made a short introduction to chatbots that shows the need for development and their implementation in all economic branches. We covered what a chatbot is and how it works, we made a brief history of its evolution, listed and described the benefits of using the chatbots, but also presented their limitations. Additionally, the article describes five chatbot models developed and implemented in different fields of activity and presents comparisons of the functionalities and applicability of these solutions. In conclusion, we emphasize the interest and concern of business people to expand the use of chatbots in all fields of activity, emphasizing its major contribution to economic progress and the development of society as a whole.

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1 Introduction

We live in a society that is constantly changing and the changes that occur are closely related to technology and science. Our grandparents and even our parents have a hard time integrating the elements that define the organization and performance of an activity by interacting with online work devices and learning to use them effectively not only in professional activities, but every day, in solving all problems in various branches of activity. Localities are gradually transforming by integrating modern technology and offering the opportunity to quickly solve any problem with the help of intelligent solutions developed by specialists in the field. Smart cities are a necessity, successfully contributing to people's well-being, to new development opportunities, to the search, identification, and quick and efficient use of the information needed by each person. The existing worldwide trend of community transformation through digitization and the implementation of intelligent applications in everything related to human activity is constantly growing and gaining depth, resulting in spectacular results [1].

The benefits of using AI are reflected in increased efficiency in the fields in which it is used, shortening the time of execution of products and their delivery to buyers much faster, customers satisfied with the purchased products, the development of new services

useful to the community, the emergence of new businesses, specific to the period in which the activity is carried out, the disappearance or replacement of activities that no longer correspond to the needs of society [2]. In a smart city, investments are focused on all sectors of activity in that city, prioritizing key sectors that contribute substantially to the relaunch or development of basic activities in the community's economy. Activities related to new sectors that develop the city and increase people's quality of life are encouraged, that teach the citizen to rationally and responsibly use the local natural resources, as well as the renewable energy produced by the community. Projects that support the circular economy are carried out and implemented; IT specialists are attracted who implement and develop intelligent solutions that educate the population in recycling and reuse of waste from different branches of activity. These wastes become raw materials in other branches of activity. A smart city also includes solutions to protect the environment, carrying out activities that reduce pollution, clean public spaces, help with afforestation, maintain green spaces, collect waste in specially designed spaces, and use the planet's exhaustible resources responsibly. In a smart city, means of transport pollute little or nothing, buildings are made of materials that we find in nature or are obtained by processing them. The electricity used by citizens is from

renewable sources. The smart grid of a smart city also includes smart water networks, even for waste water. The possibilities of achieving a smart city are beyond human imagination. We are talking about intelligent solutions related to the power plant, everything related to the kitchen, building a block or a house, the transport network in the locality, protecting citizens including intelligent applications in the Police and Army. Intelligent solutions are also developed in fields of activity such as education, health, services, tourism, finance, and the banking system. In business activity, we are talking about firms and companies that have understood the major role of AI in the development and progress of the community, company, and society. The managers of these companies allocate funds and train their employees according to the new requirements. All these new and innovative AI-related transformations and approaches will influence how the green city will develop in the future.

Current trends in technology are increasingly geared towards the use of AI-based chatbots, which represent a modern and innovative approach to the way we communicate and interact with science and technology. These applications are continually improved and prioritize our relationship with the digital environment [3].

The applications through which a chatbot helps users to quickly obtain the information they need, to be sure that this information is correct, to be able to solve various problems without having to physically travel to counters, hospitals, workplaces, town halls are increasingly used. Due to the ability to gather and manage a very large amount of information from all fields, through rapid communication in many foreign languages, through the fact that it can be used permanently, at any time and from any place, but connected to the Internet, chatbot- ul is present in all aspects of our lives. In entrepreneurial activity, in research and innovation, in companies and companies around the globe that have thousands of employees and dozens of departments of activity, in health, education, tourism, in transport, Police, Defense, in business, in the economy, agriculture, in people's homes

playing the role of personal assistant or medical assistant, in psychology, and the list could go on, that is how wide the area of applicability of the chatbot is.

A variety of devices connected to the Internet can be used to interact with the chatbot: computers, tablets, laptops, mobile phones, and smart watches. In the dialogue with the chatbot, it answers the questions of the discussion partners or can itself initiate a dialogue topic. The chatbot's conversation is based on question patterns and answer sets, all of which are categorized and ordered in the bot's database. To find a suitable answer, the chatbot searches the database for words, phrases that it compares, structures, and compares parts of speech and parts of sentences in utterances going as far as distinguishing the different meaning of the same word placed in different sentences. Being a robot, the chatbot has no emotions, feelings, and does not empathize with the user. However, in conversations that contain words that express emotions, mental states, the chatbot uses emoticons, drawings, different representations of these feelings, and pictograms, showing that it can also express communication in this way. Used in entrepreneurship, the activities it carries out can be promoted, the results obtained, and an efficient management of the activity can be achieved through a rigorous organization of the working time. The chatbot can also promote the activity in a company by describing the products and services offered, improvements made, and personalized services offered to customers, solutions developed and implemented in various branches of activity, results obtained, benefits, comparative studies of the results in a certain segment of activity and for a determined period of time. The chatbot models currently developed are becoming more and more complex trying to attract as many users as possible, respond to their needs, pay attention to the market being in line with what is sought and with the evolution of society [4].

2 What is a chatbot and how does it work?

Chatbot was thought, developed and implemented by specialists to simplify everything

related to human activity. He manages to take over a large part of human tasks and responsibilities by successfully solving actions covering all branches of activity and gradually becoming a necessity in the life of each of us. These AI-based applications are capable of understanding human language, processing large amounts of information, analyzing data structures noticing similarities and differences in conversational content, formulating quick, clear and user-friendly responses thus attracting more people to have confidence in the use of the chatbot and the veracity of the information received.

2.1 What is a chatbot?

The present unfolds in the information age, a period characterized by a multitude of AI-based applications implemented in all fields of activity. Chatbot is a word we hear often because of the spectacular original solutions developed by IT specialists that overcome knowledge barriers and achieve things that were considered impossible a few years ago [5].

A chatbot is a software application that communicates with people/users. Communication is done through channels that use text or voice. It mimics human intelligence using programs and algorithms that understand the user's request and solve their problem. A chatbot can maintain several conversations simultaneously, managing to give the appropriate answers to each user even if the domains from which the information is requested are different. The chatbot can be used both in professional activity and in everyday life. With the help of the chatbot, tickets to theaters, shows, concerts, stays in the country or abroad for family or group of friends can be purchased. Appointments can be made with the specialist doctor, for various other medical consultations in state or private polyclinics/hospitals, interviews for obtaining a job can be held, trips can be scheduled and organized or just accommodation for desired destinations can be booked.

2.2 How does the chatbot work?

Chatbot is a robot. He is constantly learning from the dialogues he has with users, continuously enriching his knowledge base. Chatbot logic is different from the way humans think. The conversation with the chatbot can be done permanently, in any language, from anywhere and at any time. User connection to the Internet is required. The specialist who develops the chatbot takes care to constantly improve it so that it provides suitable answers according to the needs of the user. The success of the conversation is based on the decision tree that offers several answer options from which the chatbot chooses the one considered to be the closest to a correct answer. Machine learning is constantly subject to the rigors of understanding and communication. The chatbot memorizes words, expressions, statements used by people with whom it communicates, using them in new contexts with other users. Depending on the words used in user messages, the user's history, the problem for which help is requested, the chatbot can analyze the user's intent. The chatbot also uses keywords that are different from one industry to another. They help in finding information faster. If we take the example of a virtual store, without the keywords the search would be performed in the entire number of products of the store, which would take quite a long time. Using the keywords, the chatbot easily identifies the product categories and sub-categories that the user wants to see helping in product evaluation and analysis, in purchasing the item according to the requirements [6]. Currently chatbot is necessary in any field of activity. It can be accessed at any time. The user must be connected to the Internet. This intelligent application offers information from any field and the quality of the information received will condition the future use of the application by other people as well. The research and implementation of intelligent applications are beyond human imagination, reaching a chatbot to play the role of a personal assistant, helping people suffering from depression, anxiety, loneliness through optimistic and constructive communication, giving advice and recommendations raising morale, by

sending messages or notifications regarding the user's personalized daily schedule - what time should he take a medicine, the day, time and place of a medical consultation, alerting the patient when symptoms of illness appear through the daily dialogue, the day of birth of the person or a family member. The chatbot can be a psychologist, medical assistant, helper and advisor in waste recycling, specialist in human resources, help for the teaching staff in the educational process [7]. Implemented in a company, the chatbot operates with large amounts of data and takes over part of the tasks and duties of employees, helping them to be more productive, to solve work tasks faster and better, to focus their energy and intelligence towards finding original creative solutions.

2.3 Brief history of chatbot evolution

The 1950s represent a reference period for the appearance of the chatbot. Interest in inventing an intelligent car is beginning to take shape. There are discussions, debates and timid attempts to make a robot that can do much of what humans do, have the thinking and ability to act. Of course, it was a period of agitation and work based on the comparative analysis of what man achieves, how he communicates, and what can be applied to a robot that would converse with a dialogue partner. Human imagination and inventiveness have no limits. Spectacular ideas for the time are put into practice and robots begin to appear that perform human physical activity or carry out a conversation with a person. The ideas are revolutionary and represent the beginning of the chatbot. **Alan Turing** makes the first contribution in this sector by putting into practice the idea of intelligent robot. In **1950** he manages to put this vision into practice by talking more and more about the intelligent car. He says that it is distinguished from man by written conversation. Other attempts find applicability in the field. We remember the **Eliza** chatbot created in **1966** [8]. The specialists who collaborated and completed this model managed to train it so that a chatbot dialogue takes place - a person in which the thread of the conversation followed the needs of the

user and solving his problem. The answers obtained from the chatbot were scripted, and it was able to formulate appropriate messages for the dialogue partner's requests.

Research in the field continues, with new chatbot designs revolutionizing the idea of a human-like robot. They bring novelty, creativity, innovation. Ideas that seemed impossible to put into practice in the past, begin to be seriously analyzed and built by constantly improving the initial models and coming up with additional features. Specialists come up with the idea of developing chatbot models in various sectors of activity, especially in the fields where big problems were registered and the intervention based on the use of the chatbot would have made the results more efficient. This is how the **Parry** chatbot was developed in the medical field in **1972**. At that time, the cases of people suffering from mental illnesses were increasing sharply, most of them being diagnosed with schizophrenia, the most severe disease in this category. The Parry chatbot helps people suffering from this mental illness by managing to alleviate the symptoms of the disease and give users confidence in using the chatbot.

Another chatbot model is **Jabberwacky** [9]. It was developed in **1980**. Among the main characteristics we list the dialogue based on the states of the soul, emotions and human experiences. The specialists programmed the chatbot to carry out the dialogue with a lot of humor, the robot managing to relax the atmosphere, relax the conversation partners, find out important things in a pleasant and attractive way, without putting pressure on the user and without him feeling in an interrogation. And in the field of psychology, chatbot models are emerging that help people suffering from depression, loneliness, agitation, nervousness, insecurity. In this sense, the **Dr. Sbaitso** chatbot is developed in **1992** [10]. Playing the role of a psychologist, the chatbot uses in the conversation words that induce well-being, which convey understanding, patience, calm, good making people feel safely and enhancing their well-being and balance. The chatbot models that developed after this period were increasingly complex and attracted more and more

users. The process started with limited applicability in existing fields of activity and continues today with a multitude of spectacular uses and benefits beyond imagination. The advances made by the human mind through study, diligence, research, years of work and careful observation of how a robot can perform much of human activity bring long-term benefits and facilitate everything related to human activity, whether we speak on a professional or daily activities level. Currently chatbot has become a necessity in all fields of activity. The results can be seen and measured and the countries that have already applied policies to encourage this digital approach continue the action by extending the process to a higher level. The phenomenon is being followed with great interest and is rapidly expanding globally.

2.4 Benefits of using the chatbot in various fields of activity

Currently, the chatbot is used in all fields of activity becoming a necessity. The applicability of AI in our society brings immense benefits provided there is accountability in everything that is undertaken, in everything that is achieved. Man, nature, the environment, a clean planet, healthy, prosperous people, with love for fellow humans and for the planet we live on, with respect for one's own work but also with tolerance for one's neighbor, with intelligence and creativity put only at the service of good. Here, in a nutshell, are basic conditions that make AI work only for the benefit of humanity. When these things are violated and man wants wealth, fame, power only for himself, when selfishness and carelessness give way, AI will also have negative influences and will be marginalized, forbidden, unwanted. It depends on us, the people, what paths we choose in the future.

In the **medical** field, chatbots developed and implemented successfully help to treat many diseases or prevent them by providing support and useful information to those who wish. There are chatbots that have the role of personal assistants or personal medical assistants, making sure that users comply with the treatment prescribed by the doctor, regularly go to

specialist consultations, correctly use recommended medical equipment or devices, and respect the rest and sleep schedule. Chatbots have implemented additional options with the help of which they record the patient's medical data creating a virtual file to which the doctor and the patient have access. With the help of the chatbot, the doctor quickly has at his disposal files of the patients he treats, without them having to physically travel for a consultation. The patient's life depends on this information. They help in establishing the diagnosis and in effective treatment by being able to be translated into several languages and the communication being done in the same way, in several foreign languages. Thus, medical assistance can be provided from anywhere and at any time [10].

In the field of **education**, the chatbot makes learning more enjoyable by coming up with various materials, courses, test models accompanied by the items according to which the marking is done, quizzes with simple or multiple answers. At the end of each test the chatbot makes the assessment by coming up with additional explanations where the recorded answers were wrong. When the pupil or student needs further explanations, the chatbot contacts the teacher by sending a message or a notification in this regard to set up a working meeting. In the database of the chatbot there is information about all school subjects. The robot follows the evolution of each pupil/student after several assessments and in all subjects showing progress or regression. Also, with the help of the chatbot, easy and efficient communication between students - teachers - parents is achieved.

In **banking**, chatbots are taking over a large part of the work of bank employees. It provides information about pensions, loans, insurance, financial transactions, guides users in using bank cards in different countries or geographical regions. They can identify and block illegal financial transactions, track users' financial situation by sending alerts or providing financial remediation support.

In the **gaming** industry, the chatbot provides support and useful information about different games, how they were created, how to play

them. User-to-user play can be teamed up, or the chatbot can play directly with the user. The games contain details of images, color, which imitate the landscapes of different geographical areas. The characters in the games look a lot like real people. The chatbot has options with which the scenery can be changed, the game conditions can be modified.

In the field of **human resources (HR)**, the chatbot helps specialists in the process of recruiting candidates. It manages to identify suitable candidates for available jobs and can track the employee's professional development throughout the activity. The interaction of employees with each other, with HR specialists, with the management team leads to the efficiency of the activity and to better knowledge and collaboration. The chatbot facilitates obtaining professional documents or submitting them online, signing them digitally, completing and submitting leave requests online, offering trainings [3].

In the field of **public administration**, the chatbot is trained for the interaction between citizens and the institution that is part of this activity segment. The goal of implementing the IT solution is for public services to be accessible to all citizens and to help their digitization. The chatbot works with large amounts of data helping employees find the information they need quickly and sending each user the requested information. Some employees have been redeployed to carry out activities that require patience and empathy, with a large part of their tasks being taken over by chatbots. We also mention the reduction of corruption among employees as a benefit [12]. In the field of **transportation**, the chatbot helps companies to get information about the activities of customers by tracking the shipped goods, order ID, other information related to the location where the goods are unloaded, the status of the product. The chatbot tracks which cars are available for delivery and which employees can deliver so that the goods reach the customer on time. Deploying chatbots helps companies track cars on the route, choose between using road vehicles or freight trains. Providing ongoing customer support leads to attracting positive user ratings through online

reviews and testimonials that attract more customers. Chatbot helps to save operational costs, increase the credibility of the company by attracting customers from all over the world.

2.5 Limitations/problems in using the chatbot

Research teams, IT specialists who work on the development and implementation of chatbots in various branches of activity know that any intelligent solution also has limits, advantages and disadvantages of its use, seeking to reduce to the maximum possible problems, mistakes, errors of the chatbot. Mismatches, misunderstandings of content, approach or information transmission may occur in the dialogue between the chatbot and users. The user does not know and cannot compare the knowledge that the chatbot has, the correctness of the information sent. He doesn't know if the guidance is right for his problem.

Another problem concerns the possibility that erroneous information sent by the chatbot can negatively influence the user's opinion about certain products or services. It is necessary for the user to get information from other sources, to look for data from people around, from specialists, on specialized sites with such information. From the very beginning of the dialogue the user must be informed whether the conversation is with a person or a robot [13]. The chatbot cannot understand complex situations, does not provide differentiated, personalized attention and has a hard time adapting to new situations. It doesn't understand complex human emotions or indirect, nuanced responses. Another limitation is the misunderstanding of the context of a dialogue, which leads to blurring, confusion, misinterpretation. The answers provided by the chatbot are based on the keywords, phrases or expressions that it recognizes and uses. There are chatbots that work independently, without integrating with other systems and exchanging information. This aspect limits the robot's ability to provide accurate and up-to-date information. The chatbot solves several tasks simultaneously. This can lead to errors, longer time to complete tasks, lower quality of services

provided. There are also limitations in terms of data protection. In the dialogue with users, the chatbot collects personal data, which is a challenge in their privacy. There are situations where a chatbot cannot connect with a system or API. This aspect limits the ability of the chatbot to provide a complete service to the user. The chatbot can also write incorrect or nonsensical messages, be overwhelmed by the large volume of information or ignore some of it.

3 Examples of chatbot solutions implemented in different fields of activity

In the chatbot examples described below I sought to identify and analyze models developed in different fields of activity and with very good results both in the implementation sector and in the development of the whole community, society as a whole.

3.1 AIR-e

This chatbot was implemented in the field of the circular economy, a branch that in Romania is at the beginning of development regarding projects for financing and responsible use of waste, recycling/reusing used materials and transforming them into raw materials for other sectors of activity. Chatbot solutions implemented in other countries in the field of circular economy are role models for a cleaner environment, for a healthier and longer life, for a planet where we want to raise our children in peace enjoying all the gifts of nature, using natural resources responsibly and being friendly to the environment. AIR-e was implemented in the Spanish city of Logroño, a community that understood the need for an ecological approach to the activity of each citizen and what are the medium and long-term influences of this action. The Chatbot implemented

on the online platform designed by TheCircularLab helped the citizens to transform the city into a much cleaner and more pleasant environment, and the results were visible in a short time. The users of the chatbot learned about the circular economy, about the differentiated sorting of waste and the collection points set up in the city, about the utility of waste sorting, about the categories of waste in which various materials are included, about the waste collection program by the company that has a contract for these services. The originality and novelty of the chatbot consists in the fact that it can recognize images provided by users, being able to direct them to the waste collection points, provide them with additional explanations about an object that is not known from which category of waste it is parts or other problems that arise in the reuse/reuse/greening process. The chatbot was highly appreciated by the entire Spanish community especially due to the fact that there were serious problems related to the cleanliness of the city, the waste not picked up periodically and the non-compliance with the cleaning schedule, the unkempt appearance of the city. The application helped the town hall to more effectively manage the issues related to the cleanliness and care of green spaces, parks and all public areas, making them clean and attractive. At the same time, people's households became cleaner, the whole city benefited. The chatbot gained interest and fame in neighboring towns, but also in the country [14]. The city was given an example of good organization and cleanliness. This is how a smart solution benefits all citizens and is known nationally or even internationally, becoming a source of inspiration and a model for future smart applications.



Fig. 1. Example of conversation in AIR-e

Figure 1 shows an example of a conversation with the AIR chatbot. The AIR-e chatbot was developed by Accenture. Specialists worked in such a way that they implemented a chatbot variant available on mobile applications and on the online platform. Through the activities carried out with the help of AIR-e, citizens are guided to correct the recycling. The additional options with which the chatbot recognizes images, recognizes voice, and writes text help it to better answer users' questions about recycling and reuse. In order to better understand the messages sent by the users, the chatbot has various NLP techniques implemented. It is useful to know that users who do not know information about the categories of waste they collect and want to sort them, can send images, pictures of this waste, and the chatbot directs them to the storage place or to the appropriate containers. AIR-e also provides explanations of which materials are in the composition of waste (glass, metal, paper, cardboard, various chemicals). After identifying which waste category, the object belongs to for recycling, it directs the user to containers that are colored differently depending on what waste is collected in them, and it directs them to the

nearest waste collection points to the user's location at the time of the dialogue. You can chat with AIR-e for free in Spanish, Basque, Welsh, and Catalan [15]. Like every chatbot, AIR-e automatically learns from every conversation it has with users. This causes its knowledge base to expand and the messages it provides in response to be constantly improved.

3.2 TensioBot

Like all sectors of activity, the medical one needs intelligent solutions. They help people so many diseases can be prevented. When the patient is experiencing symptoms of diseases or even going through serious medical problems, it is essential for him to have easy and quick access to specialist doctors, not to have to make a lot of trips to the doctor, appointments to be made online, the medical record of the patient regarding the diseases he suffers from, his medical history, the medical interventions undergone, the evolution of some diseases, the medical history of family members to be accessible by every doctor to whom the patient turns.



Fig. 2. Example of conversation in TensioBot

The TensioBot chatbot helps people with blood pressure problems. Figure 2 shows an example of a conversation with the TensioBot chatbot. It is also used preventively by people who do not have health problems but who, preventively, want to keep this aspect under control so that they have a healthy body and diseases stay away as much as possible. TensioBot measures blood pressure as a real support for cardiac people. In the category of diseases that people suffer from around the world and because of which deaths are recorded, the first place is depression, followed by heart diseases, that is, heart diseases. Here is one more reason for the development and implementation of intelligent solutions in these areas to become a necessity for mankind [10]. People using this chatbot can measure their blood pressure several times a day. When the medical data obtained by the chatbot alert the patient showing that there are problems that must be dealt with as a priority, the specialist doctor to whom the person called has quick online access to the entire patient file, to the history of the diseases he suffers from, and to

their evolution in time so that they can recommend an effective treatment. Information from the patient's medical record is stored in the chatbot database. Both the patient and the specialist doctor dealing with the medical problem have access to these data. The medical file can be accessed by the specialist doctor only with the patient's consent. Other additional options of the chatbot refer to sending notifications to the patient to remind him of a doctor's appointment, a consultation, blood pressure measurement when this has not been done periodically by the patient, notifications regarding strict adherence to the treatment program prescribed by the doctor, requesting a blood pressure measurement at least one week before the scheduled consultation to ensure that the treatment is appropriate and no other medical problems have arisen. Each person using TensioBot interacts differently depending on the problem reported. The chatbot sends alerts to users when blood pressure readings are out of range, when blood pressure is too low or too high, when the patient forgets to measure their blood pressure, or when

medical problems occur and the doctor is not contacted by a specialist. When such alerts are sent, the chatbot records in the medical record and also asks the person to write down what the lowest blood pressure value was the last time and how many times it happened, but also what the highest value was and how often it was repeated. These data contribute to the patient's awareness of the medical problem and to the urgent call of a doctor or a team of medical specialists to collaborate quickly and efficiently to fix the problem. Depending on the data obtained from the blood pressure measurement, the chatbot creates a progress graph in which all the blood pressure values collected in the database appear. This chart is sent to both the patient and the specialist. Together with other medical information collected about the patient, the doctor will be able to think of a personalized treatment, especially if the person also suffers from other diseases. Sometimes the treatment originally thought can change, an additional prescription or even a new approach to the medical problem may be required depending on factors that appear along the way and positively or negatively influence the evolution of the disease [16].

TensioBot offers users the opportunity to be informed about medical devices used successfully in the amelioration/cure of certain diseases, the data being permanently updated so that the novelties in the field are known and analyzed. The chatbot provides information about various diseases, symptoms, treatments used, smart solutions implemented in medicine, countries that apply and encourage such policies by directing funds and making serious investments not only in the medical field. We find out information about state or private hospitals/polyclinics and what conditions they treat, what are the working hours in each medical facility, which specialist doctors work, where is each location. TensioBot provides users with videos that provide information about the tensiometer's usefulness, how to use it, how the chatbot helps the patient, and what to do when alerts and notifications announce a serious medical problem. A doctor and a nurse from the public sector worked on the

development of this chatbot. People who want to use the chatbot's services can do so both on their mobile phone and on any other device that is connected to the Internet.

3.3 Humanly.io

Humanly.io is a chatbot implemented in the HR sector. It bears the name of the American company that created it, a company that came into being in 2019. The manager understood the company's development opportunities based on intelligent solutions implemented in all sectors of activity. Realize that AI and business must go hand in hand to succeed and meet the challenges of this increasingly digitized society. The intelligent solutions developed by this company are implemented mostly in HR. The chatbot dialogues with users providing useful information to all candidates, especially those who do not have work experience and are on their first job interviews. Interactions between HR specialists are also facilitated, recruiters being able to collaborate and find candidates from other countries for the job the company needs. The chatbot can check the references of candidates opting for employment on various positions put out for competition by companies in a maximum of two days. It even makes it possible to rehire people who have returned to the same positions or have been transferred from one part of the company to another. It directs to young candidates' information necessary for better preparation for the requested position, thus favoring employment by young staff, with a desire for affirmation and professional training opportunities within the company [17]. The application manages a large volume of data by classifying it into datasets that it uses based on the requests that arise. The chatbot is quick to deploy and configure. Due to the large number of users and the fact that it is improving quickly, Humanly.io efficiently solves recruitment tasks with an emphasis on performance. The chatbot benefits from automatic AI screening, an option that helps it check and analyze all registered candidates for available jobs, interview candidates from everywhere, accept and hire, professionally qualify candidates who have completed all stages of

recruitment initially established. This option helps the application to search and find suitable candidates for the available jobs by searching even on special job sites. Because it constantly dialogues with users, the chatbot can recommend questions or tasks for candidates so that they are more carefully and effectively evaluated, suitable for what the company needs. Reference checks are done even when the candidate has passed most of the recruitment steps and reached the final interview or is waiting for the job offer. Reference checking helps to protect data, increase security, make the whole recruitment process fair, honest, based on competence and professionalism. At the same time, all information

collected by the chatbot about candidates remains confidential [18]. The specialists who worked on the development of the chatbot have integrated into the application sets of questions, but also sets of answers based on which they can obtain a profile of the candidate, but also valuable information about his professional experience and his capacity for training and development. Using the ideal profile of the candidate eliminates the emotions specific to the recruitment process, the stress specific to the interview disappears, the recruitment process becomes more relaxed and pleasant, the dialogues no longer put the pressure of evaluation on the candidates.



Fig. 3. Example of conversation in Humanly.io

In figure 3 we can see a conversation with a candidate. The use of this chatbot has attracted a greater number of candidates to the available positions in the company. Employees in the company registered an increased level of professional satisfaction. And the free time of the employees registered an increase, they can spend more hours for research in the field, improvement, but also with family and friends or solving personal problems. Humanly.io is available for a fee. Companies that want to implement this chatbot have to pay the amount requested by the developer. However, for free, the company that developed it offers demos of the chatbot for those interested.

3.4 Ceba

Ceba is a chatbot implemented in the banking field. It can be used for free from any device, from anywhere and at any time, only needing to connect to the Internet. It was developed by CommBank (CBA), an Australian bank that provides enhanced services to both bank

employees and customers. The services in which the chatbot makes its contribution are related to all types of insurance, pensions, loans, guidance and support for future entrepreneurs or those who are just starting out in this segment of activity, investments in the public or private sector, services whose main purpose is the efficient management of funds and investments. In the early years this bank built offices only in the USA. The results obtained led to the expansion of the company by developing other offices in Europe, Asia, Australia [19].

Ceba communicates with users by providing information on the steps to take to solve various financial problems. It can even take over some of their tasks. Users can enter into a dialogue with the chatbot using the mobile application or by entering the bank's website. The conversation is based on written messages only. The novelty and originality of this chatbot consists in the option called "Connect with a human". Through this option the

chatbot searches and identifies the right person who comes to the aid of the user requesting help by providing explanations and additional data needed by him. Specifically, when the chatbot cannot solve the user's problem, it will search for suitable people with whom it has dialogued in the past who have the necessary information for the current problem by sending messages to them. The chatbot collects in the database information from all the dialogues it conducts with each user, which makes it possible to quickly find help in problems that arise. It is necessary for the user who requests the help of the chatbot through this option to leave a phone number in the message to the chatbot so that he can be contacted quickly by the person identified by the bot. The chatbot also collects information that tracks who is calling, who is being called, how many times a user asks for help and for what problem, what is the topic of discussion in the dialogue with the chatbot or in dialogues

between users, the quality of the information received from the chatbot or from a user. If the user's problem is not fully resolved, the chatbot will send messages to people it has interacted with and knows to be constantly informed and from other sources, who it knows are reading, looking for solutions, asking, persevering and not giving up until I find a suitable solution. Through the notification option, the chatbot sends messages to users with information identified as being suitable for a particular user, even if at that moment they are not having a dialogue with that person. The chatbot records the request and when it identifies the solution, it sends it to the user [20]. The solution can come from other conversations the chatbot has with users. For this, the chatbot analyzes everything it has stored from previous information and compares the search history with the categories of data required by each person.

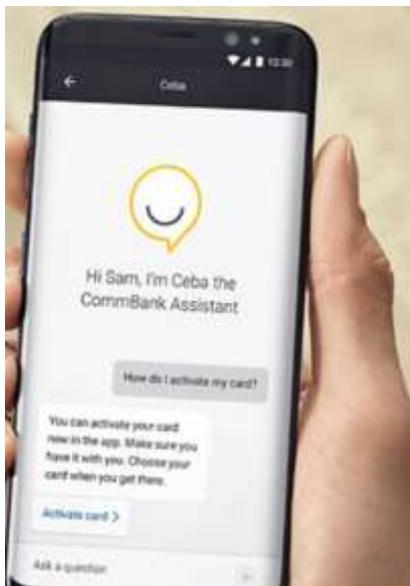


Fig. 4. Example of conversation in Ceba

Figure 4 shows how the chatbot solves a customer's problem. If using the PC, the NetBank application must be installed. If you want to use your mobile phone, you enter the CommBank application. Users benefit from free specialist assistance in any banking related issue. Data collected by the chatbot from conversations with users, from conversations between users or from other sources is

confidential. Adherence to this ethical principle increases users' trust in chatbots, in the use of AI both in banking and in other sectors of activity. Personal data is protected, which leads to increased information security.

3.5 ChatGPT

ChatGPT is the most complex chatbot model developed to date. It was launched in

November 2022 and has applicability in all fields of activity. Developed by OpenAI, a company based in San Francisco, the chatbot quickly attracted millions of users. It is free to use by anyone with an internet connection [21]. The company has also introduced a paid version with additional benefits. It uses transformations, which is the most advanced approach in the AI sector. Since its launch, people have been driven by an uncontrollable curiosity to find out what the robot can do, what answers it gives to often strange questions, what are the limits and how big is the area of coverage and action, how complex are the tasks they solve and how well.

The chatbot is used in activities related to marketing, everything related to customer support by providing help in all areas. It uses large amounts of data that it takes from conversations with users, from books, articles, texts on the web, so it learns and improves quickly. Compose poems, music, write essays, stories, translate statements or texts, summarize texts. Write computer programs, solve errors in computer projects, solve school assignments and more, solve tests [22]. It is a wonderful

partner in games of any kind. It answers questions in any field, even though many people have tested its ability to answer by asking strange questions. It's good to know that when ChatGPT is asked for help, it remembers all the information you give it trying to find a solution to your problem. The robot will save the project, theme, solving a task and then offer it to other users as support and solution. So, you have to think carefully whether you solve the problem yourself or accept the support of the chatbot, while also accepting the consequences. In the field of education, the use of chatbots has become a problem. The robot is used by millions of pupils and students who solve their homework with its help, write essays, reports, do projects, papers. It is the reason why countries like Italy or Germany have banned the use of ChatGPT by pupils, students, teachers. And other countries have this measure in their sights, precisely to prevent plagiarism and lower the quality of education. Schools in the US are warned about this aspect and in New York the chatbot is prohibited in everything related to education.

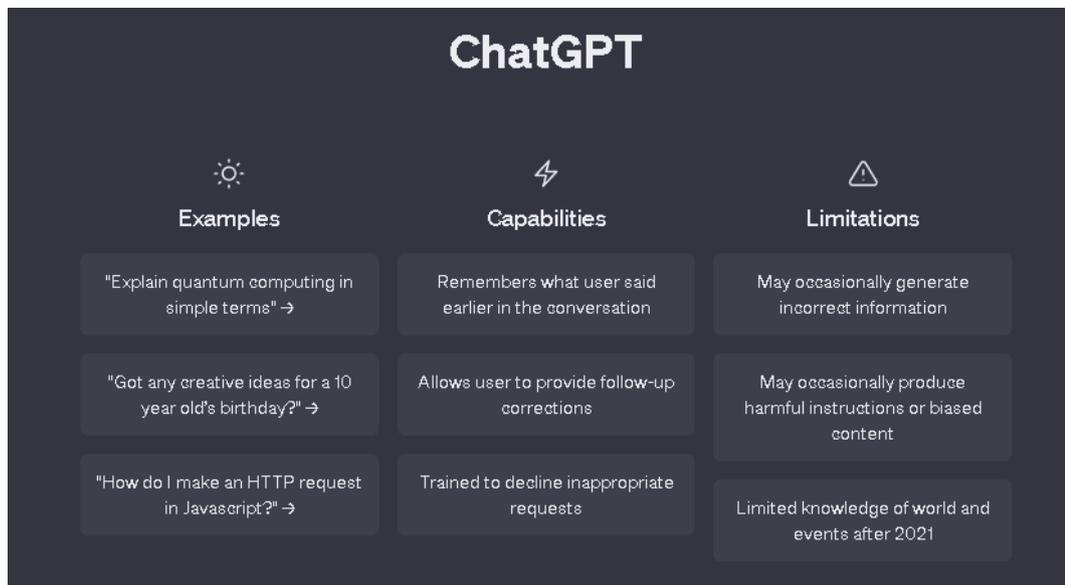


Fig. 5. ChatGPT capabilities and limitations

Figure 5 shows the opportunities and limitations of ChatGPT. The chatbot provides information about things or circumstances produced until September 2021, but also answers questions like "What if...?" put by a lot of

users testing the responsiveness and logic of the bot. It can imitate a person's speech, make recommendations, help in learning a foreign language, identify grammatical errors and correct them.

The chatbot can produce images or videos based on stored information or using online data, search, identify and use article, digital books from which to take the necessary information [23].

ChatGPT also has limits. It may provide false or unclear information and not provide answers to questions that are inappropriate or contain dangerous data that may harm the person concerned or others. Many messages are incorrect, contain grammatical errors or do not make sense, lack logic. If a user lists too many details in a request, the chatbot may be overwhelmed by the amount of data or may ignore some details. Has limited knowledge of the world beyond the year 2021. Cannot answer questions about recent events. Because it processes a very large amount of data and is

used by millions of users, the question arises of supplementing and strengthening security measures to respect user privacy [24].

In March 2023, a new version, GPT-4, was released, available to users for a fee. As a novelty element we mention the option through which the chatbot can interpret images [25].

4 Comparison of chatbot solutions described above and implemented in different fields of activity

In this section, a comparison of the 5 described chatbot models will be presented. The comparison will be made both at the level of technologies, but also of the options that each chatbot provides. It will be possible to see what options each chatbot has and what else it might bring.

Table 1. Comparison of the features of the described chatbots

	Humanly.io (HR)	AIR-e (Circular economy)	Ceba (Banking)	TensioBot (medicine)	ChatGPT
NLP	✓	✓	✓	✓	✓
DP	✓	✓	✗	✗	✓
Image recognition	✗	✓	✗	✗	✓
Automatic screening	✓	✗	✗	✗	✓
Reference checks	✓	✗	✗	✗	✗
Integration with other apps	✓	✓	✓	✓	✓
Using transformations	✗	✗	✗	✗	✓
Information in any area	✗	✗	✗	✗	✓
Connect with a human	✗	✗	✓	✗	✗
Document analysis	✓	✗	✗	✗	✓
Product of images and videos	✗	✗	✗	✗	✓
Scheduling meetings	✓	✗	✓	✓	✓

In table 1 the main functionalities of the chatbots described in the article are presented. In their comparison, account was taken of:

- the performance of each model;
- the novelty of the model;
- the field of activity in which it is implemented;
- techniques used for implementation;
- the way in which communication is done

- with the user;
- the number of users for whom the chatbot is addressed.

We also present a comparison of how satisfied the users are with the chatbots analyzed. Each chatbot will receive a grade based on several criteria. This evaluation will show where chatbots are best, but also where they still need to work to make users more satisfied.

Table 2. User review for the described chatbots

Chatbot	Security*	Dialogue*	UI*	Handling*	Data acc.*
AIR-e	7	7	8	4	6
Humanly.io	9	7	8	8	7
Ceba	9	8	7	8	8
TensioBot	6	7	5	6	7
ChatGPT	8	9	9	8	8
Out of ten					

The data in table 2 represent scores obtained based on the evaluation of chatbots by users. For example, a score of 8 (out of 10) reflects the fact that 80% of the reviews that talk about a certain indicator in the chatbot evaluation are positive.

5. Conclusions

In this paper, we presented the usefulness of the chatbot in different fields of activity by highlighting the necessity and the major role it has in the economic development of the society, in obtaining benefits multiple in both the implementation branch and adjacent domains. I described the chatbot by showing and how it works, I made a short history with the evolution of the chatbot remembering the solutions made especially in the early period when the first models appeared, in which fields they were used, what basic features were the first smart solutions, and what spectacular transformations followed over time so that the chatbot is today present in all human activities. I have exemplified the use of the chatbot in different fields of activity describing five intelligent solutions that have applicability in health, banking, circular economy, human resources, and ChatGPT - in all fields of activity. In the article a comparative analysis of chatbot models described according to:

novelty on that each chatbot brings, the performance recorded, the field of activity in which it is implemented, techniques used for implementation, the number of users, the way in which communication is carried out chatbot - user. The data from the second evaluation represent the scores obtained from the user reviews.

The original contribution of the work consists in collecting, sorting, analyzing, and recording significant data for the smart applications presented so that an assessment can be made to correct them by providing verified and correct data to people who want to know information about the latest chatbot models on the market, their effectiveness, product cost, performance registered, and benefits obtained. Also, the work serves as a source of documentation, inspiration, and information for business activities that are carried out nationally, but also globally, constituting a further proof of the successful use of AI in all sectors of human activity and showing the major role which, it has to social progress, to the evolution of the whole society.

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