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**Artificial intelligence chatbots:
socio-economic impact on the labor
market.**

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Summary

The objective of the study is to study the impact of AI chatbots on the labor market. The purpose of the work is to understand how the technology of chatbots based on neural networks develops, its impact on the formation of new professions or skills. The research methodology is a qualitative method based on in-depth interviews with experts who have experience in the field of machine learning, in particular artificial intelligence and have knowledge of market trends.

The results of the study are presented in the form of a discussion of interviews and conclusions drawn from the words of experts. This work can be useful to researchers and colleagues interested in the socio-economic development of society under the influence of the latest technologies. The obtained result will serve as a starting point for researchers who give a general idea of the position of artificial intelligence in the current realities. For colleagues who are not engaged in science, this work may be interesting as introductory material for studying the structure of the impact of technology on human society and existing practices.

Most of the interviews were conducted in the form of face-to-face meetings and recorded on a dictaphone. Some participants were not in Italy at the time of the study. For this reason, several interviews were conducted in the format of video calls.

The study "The impact of AI chatbots on the labor market", conducted on the basis of in-depth interviews, showed that AI chatbots already have a significant impact on business and the labor market. Experts are confident that in the near future this trend will only intensify, leading to the creation of new jobs, changing professional requirements and improving the quality of customer service. Despite a number of problems related to the lack of accuracy and reliability of AI chatbots, most experts believe that they will become an integral part of the business and will be used to improve processes in various fields.

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Acronyms

AI

Artificial Intelligence

NN

Neural Networks

NLU

Natural Language Understanding

NLP

Natural Language Processing

GPT

Generative Pretrained Transformer

ASR

Automatic Speech Recognition

Chapter 1

Introduction

When the first manufactories appeared in the 14th century, artisans were concerned about their future. They were afraid of losing their jobs, but they soon became part of mass production themselves. And this went on long enough until automation began in factories in the second half of the last century. The future of the trade was again threatened. However, there were people who were willing to learn how to work with the new machines. Nowadays we can notice some repetition trend in history. AI technology development does not leave anyone aside. In order to be in line with time, companies actively introduce AI in their businesses. Following the Gartner [1] report, 70% organizations will actively use AI technology by 2025. The emerging number of academic publications is also indicating that AI chatbot awareness grows. Academies publish research comparing job substitution by AI chatbots [2].

2016 OECD research paper [3] showed that there are only 10% of employees' tasks are fully automatable in Italy. The technologies improved from that time and now the new AI technology is able to work on non-routine tasks. This fact enabled another wave of disturbance in the market.

The usage of artificial intelligence and especially AI-driven chatbots only grow [4]. It was proven later in [5] and [6] that using chatbots in the HR field does improve business performance.

One of the most known AI chatbot is chatGPT. ChatGPT set absolute records for the speed of attracting new users: it reached the mark of 1 million users in the first five days after the release, and exceeded 100 million in just two months [7]. Businesses are already using it for such purposes as managing meetings, writing emails, as a personal assistant, and even as a coding tool [8]. HandLai company already uses AI chatbot technologies in its work to perform routine tasks. Such as writing customized letters to clients, compiling a job description and translating

technical documentation. Programmer Vasil Kulakov was able to get a payment from the insurance company using ChatGPT. The model helped him to rely on local laws and translate the application into German. Compilatio, a company specializing in the development of software for checking the originality of texts and combating plagiarism in educational institutions and workplaces, will soon begin commercializing a service that will allow detecting texts created by artificial intelligence, such as ChatGPT [9]

It is still important to keep in mind that AI can not only improve performance it can also lead to ethical issues and proper regulations need to be created. Also, as with many other new technologies, social resistance and rejection may arise. Therefore in this paper author would like to discuss the socioeconomic impact of the AI chatbots market penetration. The goal of this paper is to find out what kind of reaction causes a new wave of chatbots in society and how will they impact the job market in Italy.

Thus, the author designates the following research questions:

1. What is society's attitude to the increasing popularity of chatbots?
2. What new positions can appear on the market due to the introduction of chatbots?
3. What is the expected trend of chatbots development in the Italian market?

Thus, the object of this study is AI chatbots, and the subject is their impact on the market from the perspective of society and employees. The author believes that this work will help expand the understanding of businesses about the possible outcomes from the introduction or ignoring of this technology in their organization.

At the beginning of the work, the author will consider how the technology of neural networks and artificial intelligence itself works. Then the main focus will be on emerging social and economic issues along with the development of this technology. Further, the author raises the question of actions in this direction on the part of Italy. Machine learning is still a relatively new area for the country, so studying the directions of movement will benefit further development. The scope of this work also includes the creation of assumptions and forecasts regarding the development in this area. The main task of this work is to form trends and predict the behavior of labor market participants, taking into account the influence of the latest technologies. It should be noted separately that the direction of development of machine learning technologies has its own distinctive features in Italy. The purpose of the study will be achieved by solving the following research tasks:

1. Analyze the technology of Artificial intelligence, and in particular one of its branches - AI chatbots, by studying the literature.

2. Conduct interviews with experts working in the field of IT innovation, machine learning, and AI as well as those with knowledge about the labor market and its development.
3. Conduct a document analysis of the interview, compare the respondents' responses and track trends in their responses.
4. Predict the nature of the labor market development under the influence of AI chatbots.

The author believes that this work will help expand the understanding of businesses about the possible outcomes from the introduction or ignoring of this technology in their organization. The results of this study can be useful for business leaders, HR managers and anyone interested in the development of technologies and their impact on the world of work.

This work follows a deductive approach, starting with a literature review, which examines the increased interest in Artificial Intelligence around the world and the experience of other countries in the global market. Then the author narrows the scope of consideration, turning to the development of neural network technology in Italy. The methodological chapter describes in detail the approach used in the work, explaining the choice of tools, respondents and programs for analysis. The chapter "Conclusions" analyzes the results of the study and interviews, as well as discusses the results. The answers to the research questions are formed based on the analysis of the interview. The conclusion contains the main conclusions and results of the study.

The work consists of five chapters, including an introduction. In Chapter 2, a wide analysis of the topic has been done. Current developments and research in the field of AI chatbots are discussed. The basic concept of how this technology works is also given. In Chapter 3, the author explains the methodology on which the study is based, how the data were collected, and how they were processed. Chapter 4 discusses the results obtained. They are classified and primarily cover research questions. Chapter 5 is final. In the last chapter, the author formulates conclusions and gives answers to the questions posed in the introduction.

Chapter 2

Literature Review

2.1 Introduction to the chapter

In this chapter, the author would like to talk about the scientific discoveries in the field of AI chatbots that have already been made before the release of this paper. The chapter will begin with an explanation of AI technology in general and the areas of its current use. Next, ChatGPT technology is explained in detail as to how its application can optimize business performance. Closer to the final part of this chapter will discuss the current challenges, the gaps between the technology and the current data policies and the issues to be faced. The rapid development and introduction of artificial intelligence technologies have significant implications for the labor market, both positive and negative. While artificial intelligence is expected to create new jobs and boost productivity, there are also concerns that it could displace workers and exacerbate income inequality. Thus, there is a growing interest in the impact of artificial intelligence on the labor market. So far, it is difficult to find high-quality articles on this topic. The purpose of this literature review is to summarize and critically analyze existing research on the impact of artificial intelligence on the labor market, including its impact on employment, wages, and job polarization. By studying the current state of knowledge on this topic, we can better understand the challenges and opportunities that artificial intelligence creates for workers, firms, and politicians.

2.2 Theoretical Framework

It is information technology that has had the greatest impact on the development and change of traditional industrial production. The development of artificial intelligence chatbots belongs to Industrialization 4.0 and is now the latest stage of the industrial revolution. Its main mission is to combine physical labor and

operations with intelligent technology. It has already been proven to improve control of operations within companies and give them access to large amounts of data. Big data analytics, in turn, increases productivity and improves the overall growth of an organization[10]. Over the past two decades, thanks to the digital revolution and the increase in computing power, artificial intelligence has become widespread in many industries thanks to various applications that did not exist before. Despite the fact that these events are unlikely to be ignored and will have a positive impact on society, there are problems that need to be solved or at least clarified in order to allow artificial intelligence to realize its potential [11]. Biological neural networks have become the prototype of artificial neural networks. The main feature of neural networks is the ability to learn [12]. It is this feature that has become the basis for machine learning. The year of the birth of artificial intelligence is considered to be 1943 [13], when the American mathematician Norbert Wiener laid the foundation of such a scientific direction as cybernetics. In 1944 [13] and [14], the first studies on neural networks appeared. People have tried to describe the network of biological neurons mathematically. In 1957, they tried for the first time to recreate a learning neural network. Thus, the perceptron appeared (fig. 2.1. Perceptron was simpler than modern neural networks. It had only one layer and three types of elements: the first type received information, the second processed and created associative connections, and the third gave the result [13].

In general, perceptron is a simple but powerful algorithm that can be used to perform binary classification tasks and paved the way for more complex neural networks used in deep learning today [16]

Over time, computers began to develop to modern capacities. Thanks to Moore's law [17], the computing power of the Deep Blue computing algorithm allowed him to win a chess game against the reigning world champion in 1987. The idea of neural networks has become even more attractive. By that time, a large number of algorithms had been described that helped spread information across neurons, and several structures were proposed. In 2010, the direction of deep learning appeared for the first time. This is the training of neural networks with multiple volume layers. This became available thanks to the development of graphics card processors [18]. These were both single-layer and multi-layer networks, unidirectional and recurrent.

The power of the system plays one of the main roles, because each neuron constantly performs resource-intensive calculations. To solve a complex problem, a machine needs a lot of neurons, their scalable structure and mathematical functions. Although artificial intelligence (AI) is a fairly broad field, including machine vision, predictive analysis, machine translation and other areas, natural language understanding (NLU) and its generation (NLG) occupy a significant and rapidly growing part of this field. Early chatbots and their development systems

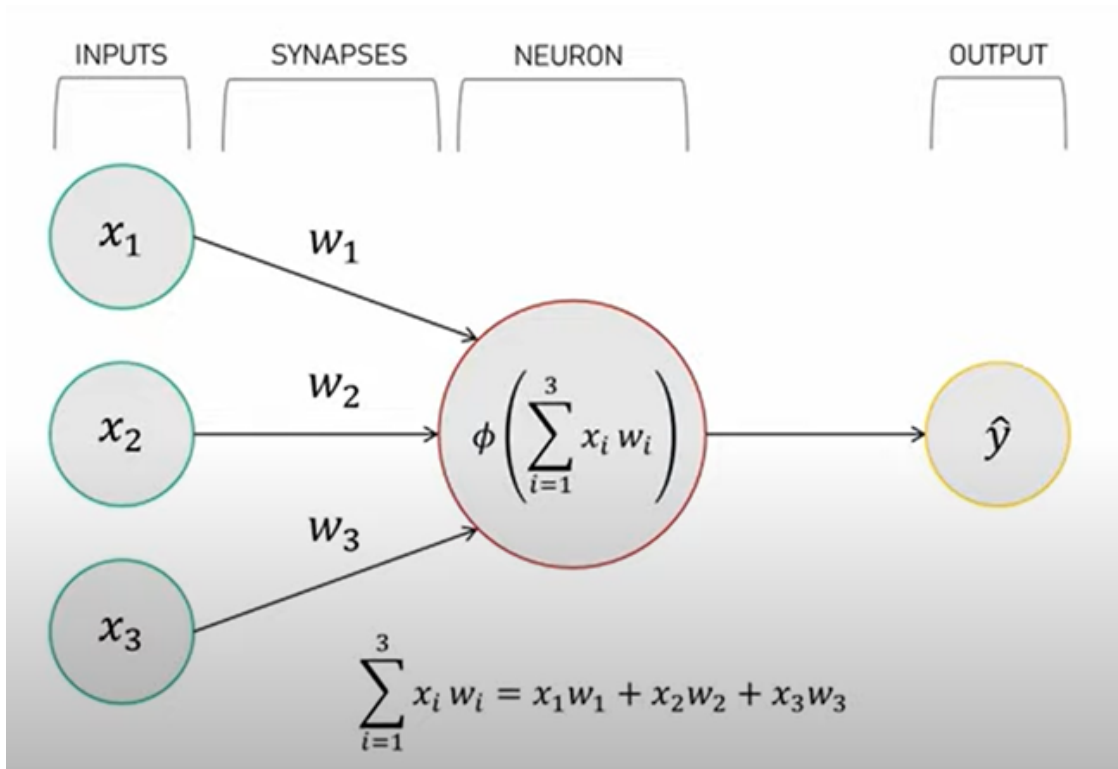


Figure 2.1: Scheme of Perceptron Algorithm (reproduced from [15])

appeared quite a long time ago. The story began back in the 50s with the work of Alan Turing and the Eliza program in the 60s, as well as scientific research in the field of linguistics and machine learning in the 90s. However, a significant event in more recent history was the appearance of the AIML markup Language (Artificial Intelligence Markup Language), developed in 2001 by Richard Wallace, and the A.L.I.C.E. chatbot created on its basis.

Over the next decade, approaches to the development of chatbots largely boiled down to the reworking or improvement of a methodology known as a "rule-based" or "formal rules-based approach". Its essence consists in identifying semantically significant elements of phrases, coding and creating special formal programming languages that allow describing dialogue scenarios. Most of us are familiar with assistants based on this approach [13]. The latest development tools based on formal rules are complex and complex systems, including:

- systems for ranking analysis hypotheses;
- selecting named entities from text;
- morphological analysis of phrases;

- dialog management systems and preservation of local and global context;
- integration and calls of external functions.

Nevertheless, the use of such systems in most cases requires considerable effort in their development. In order for a chatbot to support a wide range of topics or to have sufficient depth of knowledge in a certain area, it is necessary to invest significant human resources [19].

Recently, the situation in this area has changed significantly due to the development of algorithms for determining the semantic proximity of texts and machine learning technologies in general, which have greatly simplified approaches to text classification and training systems for natural language understanding (NLU) [20]. As a result, the process of creating complex chatbots has become much simpler, and the accuracy of recognizing user intents is significantly higher. Despite the fact that when developing dialogs, where a chatbot needs to access large arrays of external data, allocate hundreds of thousands of named entities, and integrate with external information systems, it still requires the application of a large amount of human labor, the use of new technologies has greatly simplified this process. It is these technologies, as well as the development of speech synthesis and recognition technologies and the spread of messengers and web chats, that led to the rapid growth of NLU technology implementations in the period from 2015 to 2018 [19].

Currently, there are several important factors contributing to the development of the NLU technology market. Contact centers represent the largest sector where NLU algorithms are widely used, estimated at \$330 billion per year according to Everest Group. Contact centers serve hundreds of thousands of companies around the world, ranging from banks and large retail chains to small businesses with 2-3 managers in the support department [6]. A significant proportion of routine operations are transferred to artificial intelligence. Chatbots can be used for standard queries (in FAQ mode), as well as for routing user calls to the right department of the company through an intelligent IVR, as well as as "prompters", that is, bots that help call center operators find solutions for complex queries. This allows you to significantly reduce staff costs and increase the capacity of contact centers without increasing the number of employees. Nevertheless, the most effective combination is AI + Human, when complex analytical issues are transferred to the operator, who can devote sufficient time to the client, really help and solve his problem [21]. The first mass device on the US market with high-quality speech recognition and the ability to hear a request even in conditions of strong external noise appeared three years ago in the form of Amazon Echo and its assistant Alexa. This device allows you to control a smart home, find and tell the news, order groceries at home, call a taxi, or order pizza with delivery, as well

as perform other tasks. Google followed Amazon by releasing its Google Chrome smart speaker, and at the moment these two devices share the market in a ratio of about 3:1 (the advantage is on Amazon's side). In addition, many competing devices have appeared in China, including smart speakers, robots, children's toys, car devices, and intelligent household appliances, and a large number of amazing discoveries in this area are expected by 2018. At the moment, Just AI is working on five projects related to the development of such devices. Speech assistants such as Amazon's Alexa, Google Assistant from Google, Apple's Siri, Microsoft's Cortana, and Yandex's Alice are used to determine users' intentions and execute commands. A significant part of the functionality is created using NLU platforms created by third-party developers. Amazon is building a skills ecosystem around its assistant by providing an Amazon beta. Dialogs for developers. The virtual assistant market has interested not only the end users of devices but also the automation of support for businesses, where Google Assistant already routes user requests to the contact centers of companies. In general, talking devices and assistants are the most interesting and promising areas of application of conversational artificial intelligence technologies. In addition, they are a direct communication channel between businesses and end consumers. The demand for such technologies is constantly growing, and Italy is no exception.

The interaction between the user and the chatbot can be presented in the form of a diagram, where the user starts with a request through one of the many available channels. Each request usually has a corresponding intention, or intent, which determines the user's desire to get an answer to a given question, order a product or service, or get access to certain content, for example, music or video. Such channels can be smart devices, including built-in assistants, mobile phones, traditional phone calls, messengers, or web chats, such as Livetex, Jivosite, or Webim [22].

Additional message processing or conversion of its format may be required during user interaction with dialog platforms. Due to differences in the available communication channels (for example, smart devices, assistants, mobile phones, messengers, or web chats) and message formats such as text or voice, support for ASR (automatic speech recognition), TTS (speech synthesis) platforms and integration with telephony is necessary to ensure the correct transmission of information between users and systems [23].

In addition, some tasks may require the use of biometrics platforms to identify the interlocutor by voice. Some communication channels, such as messengers or mobile assistants, allow you to combine natural language and visual elements, such as buttons or product cards, which requires integration with the corresponding APIs. When a user addresses his request to the dialog platform, his task is to understand the meaning of what has been said, determine the user's intent, and effectively process the request to form a response [19]. To do this, many technologies are used,

including text normalization, morphological analysis, semantic proximity analysis, hypothesis ranking, identification of named entities, as well as the formation of queries in machine language using APIs provided by external databases and information systems such as 1C, Bitrix24, SAP, CRM systems, content databases and services such as like Deezer or Google Play Music. After receiving the data, the dialog platform generates a response in the form of text, voice message (using TTS), content streaming or notification of completed actions, such as placing an order in an electronic store. If the initial data is insufficient to make decisions on further actions, the NLU platform initiates a clarifying dialogue to obtain all the necessary parameters and eliminate uncertainty.

Here is an overview of the internal structure of the systems involved in processing user requests in dialog systems. To analyze the process, the Just AI platform was used as an example, however, it should be noted that at the top level, the process of processing user requests is similar in most platforms for business skills. The general scheme (fig. 2.2) of the platform operation is presented below:

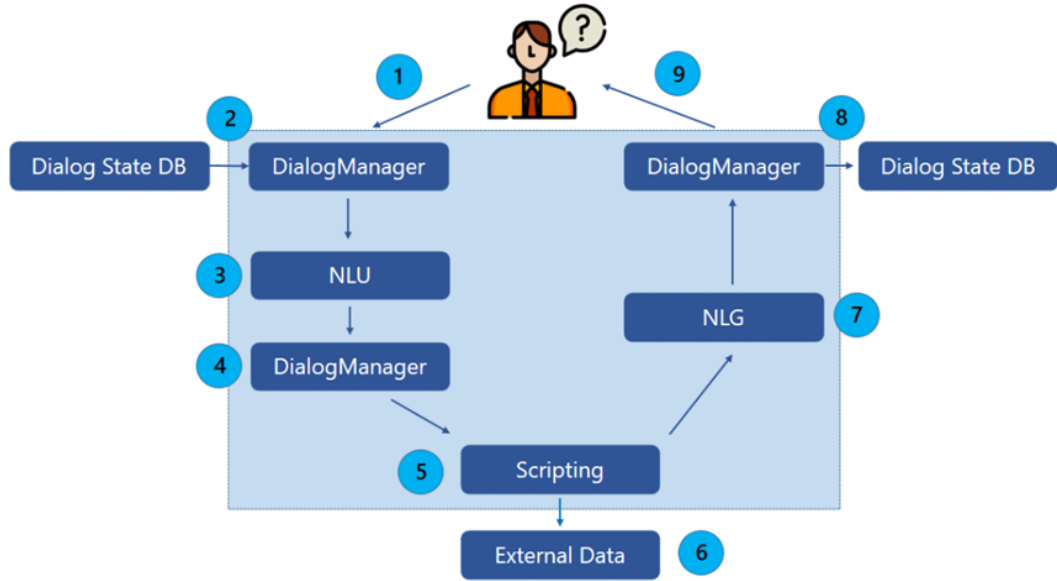


Figure 2.2: Client's Request Processing Cycle [24]

The main cycle of processing a client's request in this system includes several stages:

1. Receiving the client's request to the dialog management module — Dialog-Manager.

2. Loading the dialog context from the database using DialogManager.
3. Processing of the client's request (together with the context) in the NLU module, as a result of which the client's will (intention) and its parameters are determined. If the client's request is not text (for example, it is a button click), this step is skipped.
4. Determining the most appropriate dialog state (block, screen, page) that most fully corresponds to the client's statement, based on the dialog script and extracted DialogManager data.
5. Execution of business logic (scripts) in accordance with the specified script of the chatbot.
6. Calling external information systems, if they are programmed in business logic.
7. Generating a text response using macro substitutions and word-matching functions in natural language.
8. Saving the context and dialog parameters in Dialog State DB for processing subsequent requests.
9. Sending a response to the client.

The central component in the functioning of the system is the dialog management module (DialogManager), which allows you to determine the relationship between the user's statements, establish the context of the dialogue, and the relationship between previous and subsequent statements. Thanks to this process, the same utterance can be interpreted differently depending on the moment of its utterance, other related factors, such as the user's location, as well as the context in which it was uttered [19]. DialogManager in some systems also manages the filling of the context with additional data (slot filling), which can be extracted from the user's statement, the context of previous statements, or requested explicitly from the user. In our system, these functions are encapsulated in the dialog script to ensure that this process is fully controlled by the chatbot developer. The next key stage of the dialog system is NLU (Natural Language Understanding), the process of parsing user statements. This is the most difficult stage, during which the user's intent and its parameters are determined.

2.2.1 Neural Network technology at a glance

Neural networks are a machine learning method that mimics the human brain. It is an attempt to recreate the way humans think. It turns out that with the help of

a large amount of data and algorithms, the program must learn to find connections. The main difference between a neural network and other programs is the ability to learn. The structure of the neuron is recreated using a code. A cell is used as the nucleus of a neuron, which stores a limited range of values. Information about the so-called impulses to action is stored in the form of mathematical formulas and numbers [25]. Connections between neurons are also implemented programmatically. One of them passes some calculated information to the other for input, it receives it, processes it, and then passes the result of his calculations on. Thus, the information is distributed over the network, and the coefficients inside the neurons change — the learning process takes place. Each neuron has a "weight" — a number inside it calculated by special algorithms. It shows how important the neuron data is for the entire network. During training, the weights of the neurons are automatically changed and balanced [26]. Neurons in networks are independent of each other. Each neuron is not connected and does not affect the operation of another neuron. They receive information from each other, but their internal process does not depend on other elements. Therefore, even if one neuron fails, the other will continue to work — this is important in the issue of fault tolerance. Such stability is also characteristic of biological neural networks, which continue to work even if they are damaged. To train a neural network, it is not enough just to load a huge amount of data into it. It also needs to be partitioned for training. For example, if a person wants to train a neural network to distinguish a dog's paw from a cat's paw, it will be necessary to mark certain indicators under each instance. For example, a dog's paw is big, and a cat's paw is soft [27]. Each neuron in the network accepts a certain amount of data (an input vector), performs some mathematical operations on them (for example, multiplication by a weighting factor) and transmits the result to the next neuron. In addition, each neuron has its own activation function, which is applied to the output of the neuron to determine whether the neuron should activate and transmit the signal further or not. Formally, the calculation of the output value of the y i -th neuron in the network can be represented by the following formula:

$$y_i = f(\sum_{j=1}^n x_j w_{ij} + b_i)$$

where x is the j -th input signal from the j -th neuron, w_{ij} is the weighting factor between the j -th and i -th neuron, b_i is the displacement of the i -th neuron, and f is the activation function.

Neural network training takes place by selecting optimal values of weights and offsets that minimize the network prediction error on the training data. To do this, various optimization algorithms are used, such as stochastic gradient descent or its

modifications. Deep neural networks contain several hidden layers with millions of neurons connected to each other. Scales denote the significance of the connections of one neuron with another. If one node provokes another, then in this case it is assumed that this weight is positive. If on the contrary - one node suppresses the other, then the weight is negative [28]. The greater the value of the weights, the greater the influence of the neuron on the entire network. Such an example of a deep network can be seen in the figure below (fig. 2.3)

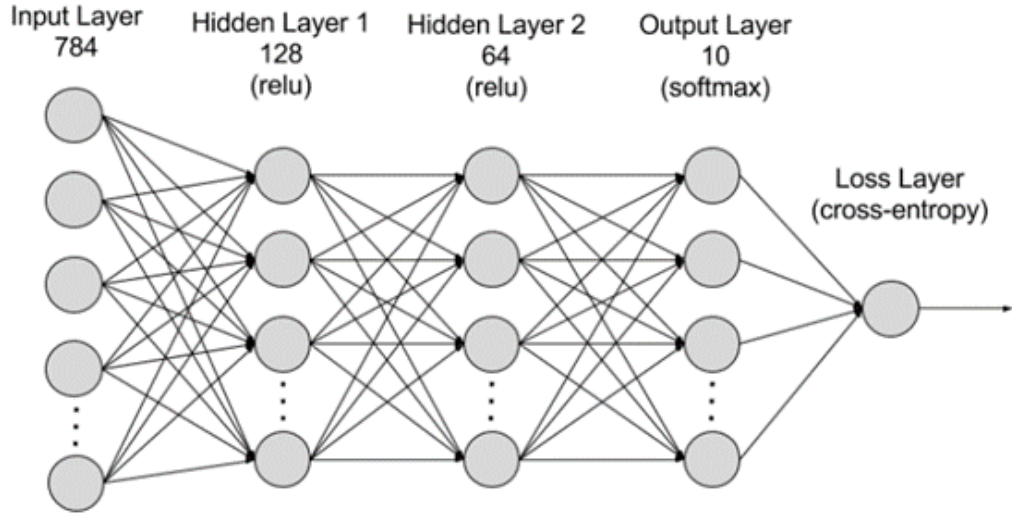


Figure 2.3: Deep Network Scheme [29]

So far, large companies are mainly working with neural networks. In order to create a neural network capable of working efficiently enough in difficult conditions, powerful machines and large sets of training data are needed [26]. Only large corporations can afford such resources. Neural networks can also introduce startups into their work. They mainly work on leased capacities and concentrate on creating a neural network for specific tasks, for example, Prisma. At the moment, neural networks are actively used in recommendation systems. For example, a neural network is used to select a movie on Netflix. In addition, neural networks are used by large banks to calculate the size of the loan or individual offer.

2.2.2 AI chatbot technology

Chatbots, which are able to maintain a dialogue with the interlocutor scientists refer to the language models. Despite the fact that ChatGPT and corporations are investing in it, language models are not a new phenomenon. LLM are neural network models that are used to generalize, understand and write texts in different

languages. In the process of learning, neural networks "show" a large number of fiction, Internet forums, encyclopedias and other sources to teach them the language and give them the opportunity to communicate with the machine. Such neural networks are located in advanced AI assistants and are used to communicate with the machine [30]. A language model, in turn, is a probability distribution over a sequence of words. For each sequence of words of a certain length, the model determines the probability for the whole sequence. In less scientific terms, the model guesses every next word in a sentence. It is worth noting that uncomplicated language models were used back in the early 2010s with the release of smartphones [23]. Inside the language models in a super simplified approximation is a set of equations

$$y = kx + b$$

where x is the word input; and y respectively is the word next that we are trying to find and predict its probability.

The most valuable thing about teaching large language models is that they can be trained, but absolutely any human-made set of text data, and there is no need to reverse-engineer it in any way beforehand. Thus, any completely human-made text is a huge set. Such sequences, where you take some words and then look at what word came next. Nowadays, language models are used in a large number of services: they help to maintain a dialogue while communicating with a voice assistant, offer fast variants in search, learn to translate qualitatively, and can even evaluate the content of posts on the Internet [31].

LLMs also have "descendants" - neural network models, retrained for specific tasks (fine-tuned models). Using common language models, they create a copy that is configured for a specific domain or task, such as analyzing medical research or searching for errors in the code [31]. This process of retraining neural networks is called "tuning".

In fact, in equations such as Y , language models try to predict not so much the specific next word, but the probabilities of different words that might follow the current text. The probabilities of the next words falling out are equal to the probabilities that the model estimated as equations. Thus, the model may give different answers to exactly the same queries [32]. In doing so, scientists have tried to create models that will produce the same results for certain queries. However, this has not yet succeeded. The models began to get confused or went in cycles.

The most advanced language model technology at the moment is GPT. GPT stands for Generative Pretrained Transformer. And the main word is transformer,

which means a special neural network architecture that was developed by Google programmers in 2017. All the prosperity that we see in neural networks nowadays is all thanks to Transformers in the first place. Briefly, Transformer is such a universal computational mechanism, which is very easy to describe. It takes as input one set of data sequences and outputs another set of sequences, but already transformed according to some algorithm. Since the text, pictures, sound, and almost everything in this world can be represented as a sequence of numbers, it turns out that Transformer can help to solve almost any problem, but the main thing about Transformer is its convenience and scalability [33]. Because it consists of very simple block modules that are easy to combine with each other and easy to scale. Before Transformer models weren't able to process the volume of data when they were trying to get them to process too fast or too many words at a time. But transformer neural networks have no problem processing huge amounts of data and handle it much better.

GPT-1 first appeared in 2018 and demonstrated that a transformer architecture could be used to generate text. With GPT-2, it was decided to radically improve the model by two key parameters - the dataset of training data and the volume of the model itself, that is, the number of parameters. However, the programmers did not have special training in official datasets. So the Open ai developers downloaded a huge amount of text from Reddit. Of all the posts that had three likes or more. There were 8 million such texts, about 40 GB. In the GPT-2 model that came out in 2019, the x parameters in the equation were 1.5 billion. The model didn't need to learn the whole text verbatim. It needed to identify a set of patterns, rules, and parameters to extract from that text. The k coefficients or weights did not need to be re-evaluated each time you train, they were evaluated once. And the parameters x were fed with new ones each time. The equation each time substitutes new x 's, and the coefficients remain unchanged. It turns out that the more complex equations with more parameters set in the internal model, the better. Task sets chosen specifically for text ambiguity and the ability to understand it helps determine the quality of a language model. For example:

The fish took the bait. It was tasty.
The fish took the bait. It was hungry.

Humans can easily do this task and figure out the answer from the context. But to understand it, one must not just read the sentence, but understand the logic and function of all these entities. Early language models could solve such problems only 50% of the time. In order to train such models to solve such problems, scientists tried to accumulate a large database of such problems, but they only managed to

get 60% of correct answers, which is quite low. However, GPT-2 itself teaches such a problem and solves it with the correct solutions of 70% [34].

Moreover, this kind of qualitative leap occurs non-linearly: for example, with a threefold increase in the number of parameters from 115 to 350 million, there are no special changes in the accuracy of solving contextual tasks by the model, but with an increase in the size of the model by another two times to 700 million parameters, the neural network begins to successfully solve tasks completely unfamiliar to it. This is called Winograd Schema Challenge (fig. 2.4)

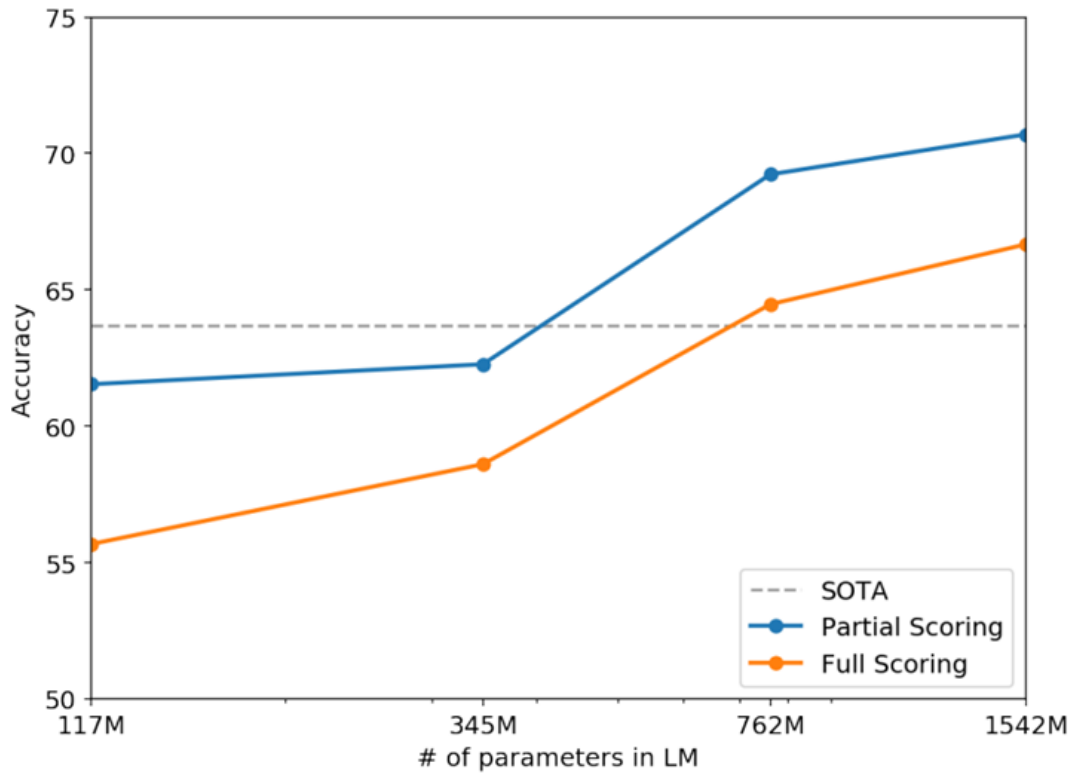


Figure 2.4: Winograd Schema Challenge [34]

Released in November 2020, GPT-3 had 116 times more parameters. The neural network began to weigh 700 gigabytes. The data set for GPT-3 training has been increased by about 10 times to 420 gigabytes. This version of the model was trained on all kinds of Internet data. In turn, ChatGPT was trained on data until 2021 [35]. The figure below shows the accuracy of the responses of neural networks with a different number of parameters to problems related to addition/subtraction, as well as the multiplication of numbers up to five digits [36]. As can be seen from the graph, when moving from models with 10 billion parameters to 100 billion, neural networks begin to solve mathematical problems 2.5.

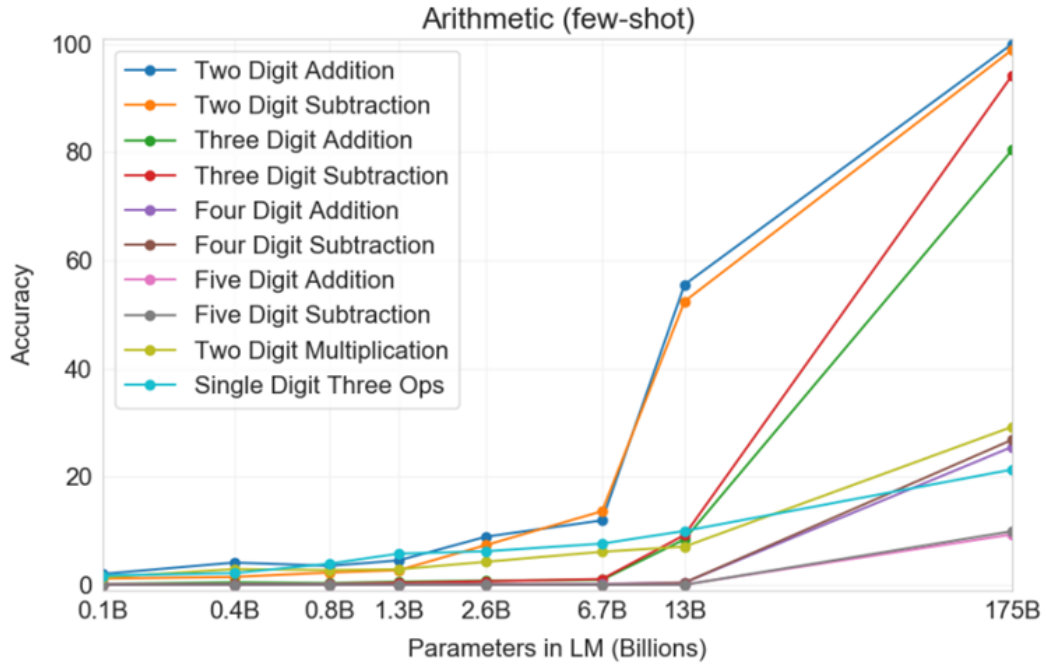


Figure 2.5: Math Problems Solved by NN [36]

However, it should be understood that the neural network does not have consciousness of its actions, and does not have the ability to reason independently. Even if it creates content, it does it automatically, based on previous data, and not thanks to its thoughts. It is difficult to imagine that a neural network, even the most complex, will be able to determine that its created sentence is meaningless. Also, there is no concept of "meaning" for it. Although systems that create content that resembles the real one already exist, their number is still limited [37]. The opinion that books and paintings created by a neural network will not be able to replace human creativity is still relevant, even if algorithms perfectly mimic our creativity. But by developing this area, you can create more and more realistic and high-quality content. Today, the development of nanotechnology is more relevant than ever.

2.2.3 How AI chatbot differ from non-AI and voice assistance

A traditional chatbot, as a rule, lacks the ability to understand the meaning of messages and does not have the ability to interact effectively with the user. Its functionality is limited to responses to predefined commands, menu demonstration,

ordering, and payment acceptance. As a result of performing such actions, the bot transmits the received information to the customer relationship management system (CRM), where a customer card is generated.

In some cases, a traditional chatbot can respond to customer requests, but such responses usually have a low degree of compliance with requests and may leave users' needs unsatisfied.

A chatbot using artificial intelligence has the ability to understand natural language. It is able to process incoming user messages, analyze their content, identify familiar keywords and their synonyms, and then apply neural network algorithms to generate responses. The bot is able to generate answers that seem to be written by a living person.

In order for an artificial intelligence-based chatbot to understand human speech, natural language processing (NLP) is required. The NLP algorithm splits messages into sentences and individual words, removes stop words, and converts the remaining words into vectors of digits. The chatbot uses these vectors to understand the user's message. After the chatbot determines the purpose of the message, it collects important information such as date, time, place or location to form the most accurate response to the user's request.

A chatbot in the usual sense is software that can simulate a discussion in natural language or chat with a user via messengers, websites, mobile applications, and so on. Today, a chatbot is one of the most advanced and promising forms of human-machine interaction. Task-oriented chatbots provide answers to frequent user requests using pre-programmed response options. Such systems are also called declarative chatbots [31]. They are the most common forms of customer assistance technology, users are usually provided with multiple-choice questions and hints that help them in the interaction process, allowing them to choose from predefined possibilities. A restaurant, for example, can use a task-oriented chatbot on one of its social media channels to answer the most frequently asked queries. Such chatbots do not always use AI technology. Chatbots are no longer a new technology and many of them have long been used by mobile operators or banks [38]. However, the main difference between a simple chatbot and AI is that the latter uses generative AI technology. Thus, machines with AI have the opportunity to self-study and give unique answers. Chatbots focused on the execution of tasks are less complex and data-driven. And chatbots with a prediction function also use AI technologies and large amounts of data. They are also called conversational chatbots. They try to predict what information the user will need. An example of chatbots with a prediction function is virtual assistants that come with most smart gadgets. These chatbots can talk and maintain brief dialogues with people and collect data from the Internet to teach new answers [39]. Chatbots and voice assistants are two different types of software that use artificial intelligence to process requests and provide answers to users [40]. The main difference between them is how the user

interacts with the program. A voice assistant typically uses voice input and voice output, whereas a chatbot uses text input and output. In the case of a voice assistant, the user asks a voice question, which the software converts into a text format and then analyzes to understand the request. The voice assistant then uses neural networks and natural language processing algorithms to determine the best answer to a question and transmit it to the user by voice.

A virtual assistant powered by artificial intelligence is a voice assistant. It has the ability to recognize the user's speech, analyze his responses and execute commands given by a person. According to statistics, 91% of users use voice assistants to get answers to questions, 89.5% to listen to music, 85.2% to check the weather, and 71.4% to set a timer (fig. 2.6).

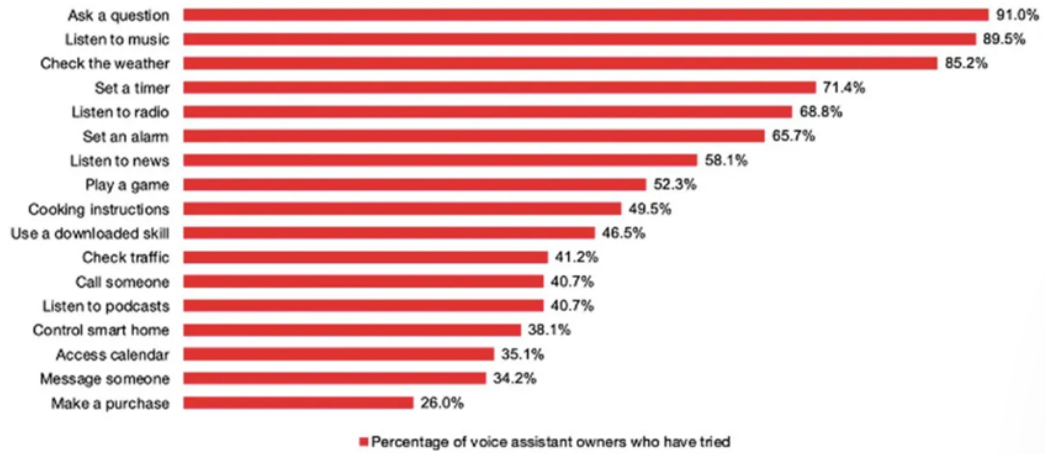


Figure 2.6: Average voice assistant owner's requests [41]

The marketing potential of voice assistants lies in their ability to deeply personalize processes, stimulate sales and provide marketers with a deeper understanding of customers. They not only improve the quality of customer service but also contribute to additional sales [41].

These voice assistants are based on a conversational approach, which allows you to effectively interact with customers and create an emotional connection with them. According to 90% of marketers, voice assistants will be an important marketing channel in the next 3-5 years [42]. One of the key functions of voice assistants is to call people to action. They remind a person about a product or service, offer to make a purchase and offer alternative options on request. This helps to maintain customer interest and increase sales. Chatbots, on the other hand, work with text messages. The user enters their query as a text message, and then the chatbot uses natural language processing algorithms and neural networks to understand

the question and provide the best answer in text form. In general, voice assistants and chatbots have a common basis - artificial intelligence, neural networks, and natural language processing algorithms. However, the differences in the ways of interacting with the user make them more or less suitable for different situations.

2.2.4 Types of Chatbots

Chatbots are software applications that have the ability to automatically interact with users via text messages. They can be classified according to various parameters, among which stand out: the subject area, the service provided, the goals, the method of processing input data and generating responses, human assistance and the method of assembly. The classification based on the domain of knowledge takes into account the amount of knowledge that can be available to the chatbot, as well as the amount of data on which it can be trained. Chatbots of the open domain are able to maintain a conversation on a wide range of topics, while chatbots of the closed domain specialize in a certain area of knowledge and may not answer questions that go beyond their expertise [43]. The classification of chatbots can be based on the services they provide, taking into account not only the type of task they perform, but also sentimental proximity to the user and the degree of intimacy of interaction. Chatbots designed for interpersonal communication provide communication between the user and other entities, providing services such as booking seats in restaurants and booking airline tickets. Unlike intrapersonal chatbots, they are not the user's companions, although they can have personality and remember information about the user. Intrapersonal chatbots, such as those used in mobile applications, provide a more personalized approach to user service. They are able to understand the user in the same way as a person does, and can be the user's companions. While interagency chatbots can exist in various spheres, it is necessary to ensure the possibility of interaction between them. The need to develop protocols for such interaction has already become clear, an example of which is the integration of Alexa and Cortana voice assistants. According to the goal-based classification, chatbots can be divided into several categories, taking into account their main goals. One of these categories is informational chatbots designed to provide the user with information that is stored in advance or accessible from a fixed source, such as chatbots with frequently asked questions [34]. Chatbots based on chat, on the other hand, strive to conduct a dialogue with the user, just as a person does, and their main goal is to correctly interpret the message received from the user. Task-based chatbots perform a specific task, for example, booking a flight or helping in a certain area. They are also able to intelligently process requests for information and understand the data entered by the user. Examples of task-based chatbots are restaurant booking bots.

There is also a classification based on the method of processing input data and generating responses, which takes into account the methods used by chatbots to generate responses to user requests. According to this classification, three models are used to obtain the appropriate answers: a rule-based model, a search-based model, and a generative model. Each of these models has its advantages and disadvantages depending on the specific task that the chatbot must perform. Chatbots using rules are a type of architecture that was used to create many of the first chatbots, as well as to create many online chatbots. These chatbots choose an answer based on a fixed, predefined set of rules, which is based on recognizing the lexical form of the input text, but does not generate new text responses [44]. The knowledge that is used in the chatbot is manually encoded by a person, organized and presented in the form of dialog templates. A more complete database of rules allows the chatbot to respond to more types of user input. However, this type of model is unstable to spelling and grammatical errors that may be made by the user when entering.

Most of the existing rule-based chatbot research studies the choice of response for a one-time conversation, in which only the last entered message is taken into account. In more advanced chatbots, which strive for greater similarity to a person, a multi-turn answer selection is used, taking into account the previous parts of the conversation, in order to choose an answer that corresponds to the context of the entire conversation.

Chatbots are multi-process systems that require the integration of many methods and technologies to achieve the desired level of functionality. Developers must define the goals and objectives of the chatbot in order to select the appropriate algorithms, platforms and tools. It also helps end users understand the capabilities and limitations of a chatbot.

When designing a chatbot, it is necessary to take into account the accuracy of knowledge representation, the response generation strategy and predefined neutral responses that will be used in case of an incomprehensible user statement. Dividing the chatbot into its component parts in accordance with the standard helps to apply a modular approach to development.

The overall architecture of the chatbot includes several modules, such as a language understanding module, a data storage module, and a response generation module. These modules work together to provide the functionality of a chatbot. The figure below shows the general architecture of the chatbot 2.7, which is the basic block for the development of specific chatbots.

2.2.5 Which AI chatbots are currently on the market

ChatGPT is one of the most popular demonstrations of large language models, which has become accessible to ordinary users through a simple interface. However,

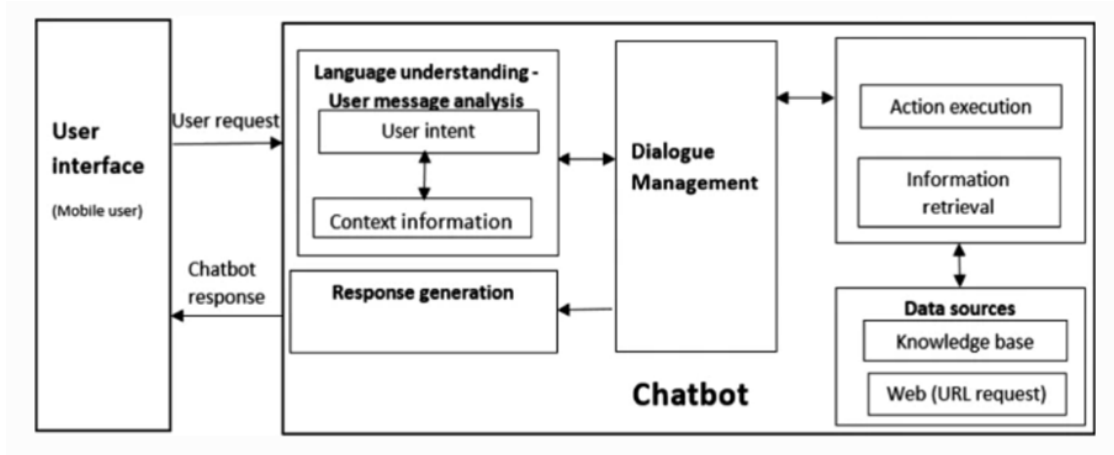


Figure 2.7: Traditional Chatbot Acting Scheme [45]

this is not the only solution. There are many other language models that have been publicly available for a long time. Hundreds of programmers and scientists study, develop and apply these models to solve their problems, and some startups use them as the basis for their products. BLOOM, developed by a free consortium of more than 1,000 artificial intelligence researchers, including Russian scientists, such as employees of the scientific group "NLP" of the AI Institute of Artificial Intelligence and colleagues from the AGI NLP team, is an open source multilingual model. The GPT-3 model from Openair is the predecessor of ChatGPT and has been trained to effectively and plausibly continue texts by predicting the following words, sentences, and even entire paragraphs. BlenderBot3, is a chatbot available to everyone, delivered with open source and data for use. The MT-LG model, created by Microsoft and Nvidia, is one of the most powerful in the field of text analysis and natural language processing. This model is able to understand the meaning of texts and generate appropriate natural responses. The source code and data for working with this model are publicly available. Sparrow from DeepMind is a dialog agent that is trained based on user feedback. The purpose of creating this model is to reduce the risk of unsafe and inappropriate reactions. But at the moment, this agent remains closed to users. Google's LaMDA, a model that allegedly convinced the engineer of its reasonableness. Currently, only a limited demo of the AI Test Kitchen model is available in the Google Play app marketplace. Despite this, LaMDA will become the basis for creating a Bard model competing with ChatGPT. Google's Palm model, which has 540 billion parameters, has high performance, according to its creators. However, it is only available to developers within the company.

LAION's OpenAssistant model is being developed by a community of Data Science researchers and developers who are striving to create a dialog bot that will not

only be accessible to a wide range of users, but also compact enough for use on ordinary computers and mobile devices.

2.2.6 Social and ethical issues

Ethical issues related to the use of artificial intelligence systems include liability for errors, lack of policy rules, and lack of trust caused by the general use of data. To date, these problems remain the most controversial, and it is unclear how they can be solved. GPT-3 is trained to predict the next word in a giant dataset obtained from the Internet. The Internet does not always write the right and useful things. The question arises that people expect neural network responses to be harmless and non-toxic. Otherwise, this model will be banned, and its creators will be sued for insulting the dignity of users. When researchers tried to solve this question, they found that the properties of the model "accuracy/usefulness" and "inoffensiveness/nontoxicity" often contradict each other. For example, an accurate model should issue instructions on *"how to prepare an explosive device at home"*, and a model trained for inoffensiveness in the limit will respond to absolutely any request *"sorry, I don't have this data"*.

The solution to this problem was called "AI alignment". There are a lot of difficult ethical issues here. The main catch here is that there are a huge bunch of controversial situations, and it is simply not possible to formalize them clearly. Many countries have their own views on what is ethical and what is not. Often there is no reference book where this could be described. At the same time, questions of ethics change even within one culture from situation to situation. It turns out that ethnicity is a purely human concept, which is often based not only on the input parameters of the situation, but also on social intuition. It is extremely difficult to solve such issues and teach this machine. However, work is currently underway in an attempt to find answers [46]. At the moment, people can't just write 1000 rules, with what you can do and what you can't do. Moreover, even if people do this, there is a high probability that the neural network will find 1001 cases that will help it circumvent all the rules. Similarly, we cannot ask to be a neural network "good" or "bad", because for a machine these concepts are vague and inaccurate.

As a result, at the moment the best solution to the ethics issue is to give the model a lot of feedback. In a sense, this is exactly how children learn morality: they try different things and at the same time carefully monitor the reaction of adults [47]. Literally, people sat and evaluated the responses of the neural network to see how they met their expectations, taking into account the request issued to it. This is called the feedback learning process [43].

Neural networks are designed to be as user-friendly as possible. Therefore, sometimes they give false answers to facts that they do not know. This behavior is called a neural network hallucination. In the example below, the author requests

the name of the cat of a character from the Harry Potter series of books. It is known that this character did not have a cat. However, the neural network, instead of indicating an error, composes the name and description of the cat (fig. 2.8). But this is understandable. AI does not see the difference between a scientific article and a short story on the forum. Therefore, he gives the same weight to both of these texts, assuming that they are both true. But if chatbots cannot distinguish between truth and fake, then they are not so reliable for searching.

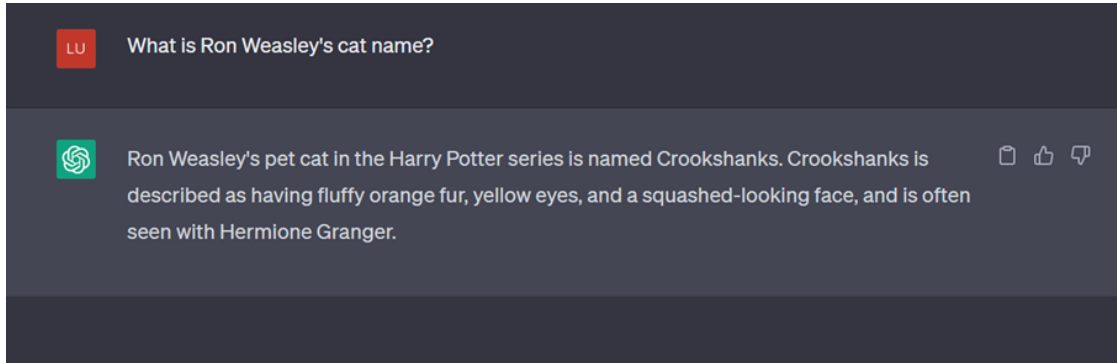


Figure 2.8: Hallucinations of an AI Chatbot

The main categories of ethical issues related to the use of artificial intelligence include:

- Trust in decisions based on artificial intelligence: In some areas, such as healthcare, people may have difficulty making decisions made by machines, as they prefer the personal approach of an expert.
- Unethical use of data exchange: Artificial intelligence systems need a large amount of data, and a clear regulatory scheme is needed to avoid misuse of shared data.
- Algorithm bias: Human-driven algorithms can reinforce discriminatory biases inherent in human behavior, leading to the potential unfair treatment of various social groups.
- Opacity of algorithms: The increasing complexity of artificial intelligence algorithms makes it increasingly difficult to track results to their inputs, creating black boxes that contradict the concept of transparency and fairness.
- Filter bubbles: The creation of artificial intelligence-based filters used to micro-target citizens could potentially lead to fragmentation of society, polarization, and radicalism.

To address ethical issues, the European Commission published on April 8, 2019 the "Ethics Guide for Trustworthy Artificial Intelligence"¹¹. In order for artificial intelligence to be ethically trustworthy, it must adhere to 4 principles:

- Respect for human autonomy
- Harm prevention
- Justice
- Transparency

Open AI conducts large PR companies for its developments, such as GPT-3, DALE 2 and the current ChatGPT model, as well as GPT-4. However, has any technological breakthrough been made in Open AI and something new has been created? ChatGPT was created by experimenting with combining GPT-3 and reinforcement learning, which allows you to convey the desired human values inside GPT-3 by reinforcing examples of truthful, unbiased, detailed and interesting answers. Although not all the experiments were presented to the public, a large series of studies was clearly carried out. Although it is possible to doubt that the development is completely new, the desire of other teams to repeat it is justified. Not so long ago, on the Meta site, it was possible to request some scientific idea, and AI gave out an entire article or a block of formulas on the topic. It was the inability to answer the question of reality and the inability to verify it that led to the fact that the demo of the Galactica model, developed by META, was suspended [48]. However, weights and code remained available. For comparison, this model was of the same order as the GPT-3. The reason for the "failure" is clear - the model gave out links to non-existent articles, and was mistaken in facts (like almost all language models).

2.2.7 Existing Business and Labor Market Impact

The use of AI chatbots in the labor market can have many advantages for various industries. In particular, they can significantly speed up and simplify the processes of communication and interaction between companies and customers, employees and employers, as well as improve the quality of customer service and reduce staff costs.

For example, in the field of customer service, AI chatbots can quickly and effectively answer customer questions, help with the selection of goods and services, as well as provide support in solving emerging problems. This can significantly increase customer satisfaction and increase sales. In the field of HR services, AI chatbots can automate recruitment processes, facilitating the tasks of recruiters and speeding up the hiring process. They can also help train employees by

providing real-time information and recommendations. AI chatbots can also be used in educational institutions to help students get answers to their questions and facilitate communication with student services. In addition, AI chatbots can be used in medical institutions to help patients get information about their health, make appointments and solve other issues related to medical care.

In general, AI chatbots can make work more efficient, economical and user-friendly in various industries if properly configured and used. However, it is also necessary to take into account ethical and safety aspects in order to prevent possible negative consequences.

In 2020, the chatbot market was estimated at 17.17 billion US dollars, and it is projected that by 2026 this market will grow to 102.29 billion US dollars. This is due to the development of deep neural networks, machine learning and other artificial intelligence technologies. Chatbots and other virtual assistants are used in various industries, such as retail, financial and banking sector, healthcare and others [49]. Chatbots are widely used in the banking sector due to their ability to quickly and accurately answer customer questions and improve communication with them [50]. Overall, this market will continue to grow in the coming years, opening up new business opportunities and improving the user experience.

Thanks to the rapid growth of chatbots, companies are increasingly ready to integrate this technology 2.9 into their business portfolio. According to the MIT technical review, 90% of enterprises noted a significant reduction in the time to resolve complaints when using bots.

Chatbots in the field of healthcare make it easier for consumers to receive medical services, improving labor intensity, efficiency and communication with medical professionals. For example, Northwell Health uses chatbots to help patients get cancer care, and Premiera Blue Cross has developed the Premiera Scout chatbot to help patients [51] understand their medical benefits. In addition, the Mayo Clinic is delving into the research of voice-activated bots.

Many startups in the Asia-Pacific region are investing in chatbots and machine learning technologies [52]. In addition, small and medium-sized enterprises are rapidly introducing the use of chatbots into their customer service processes, which ensures smooth operation, servicing a large number of customers and improving methods of interaction with them. In July 2019, Floatbot created an artificial intelligence (AI) chatbot for Andhra Bank's main banking servers to support 50 million customers. This chatbot is designed to provide digital interaction and automated customer support and has passed a thorough testing process that includes more than 50,000 requests [53].

A lot of small and large participants make the chatbot market extremely competitive. Key players apply various strategies, including product innovation, to stay at the forefront of competition. At the figure below 2.10 you can see the predictions to the chatbot market growth up to 2024 year. There are many participants in the

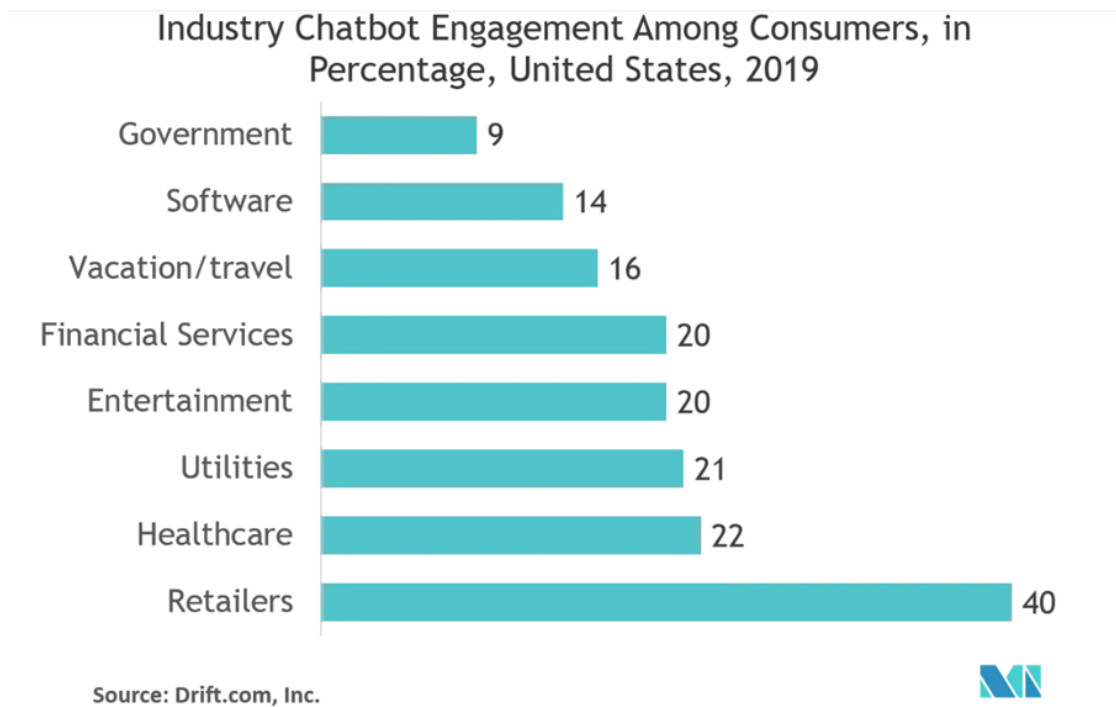


Figure 2.9: Industry Chatbot Engagement Among Consumers [52]

chatbot market, including IBM Corporation, Dialogflow (Google), Amazon Web Services Inc. (Amazon Lex) and others.

When implementing artificial intelligence systems, government managers often have to face high technology costs, as well as possible problems of non-acceptance by users due to low awareness or skeptical attitude to new technologies. At the moment, there is no accurate information and trends on the impact of AI chatbots on the labor market. However, it is already possible to track several progressive decisions of the current life. For example, programmer Vasil Kulakov was able to get payments from an insurance company using ChatGPT. He had recently moved to Germany and did not know the laws and the German language. To prove to the insurance company the need for payment, Vasil would have spent several days studying the regulatory laws and translating the entire text. However, by leaving a neural network request, the man was able to do it in a couple of hours.

Similarly, a student of the Russian Institute Alexander Zhadan wrote a thesis in just a day using ChatGPT. While an ordinary student will need several months of work to implement the project [54].

In parallel, a wave of suspicions broke out that AI chatbots could replace search engines. For many people, search engines such as Google, Yandex, or Yahoo are the gateway for access to content on the Internet. If you need to find something or find

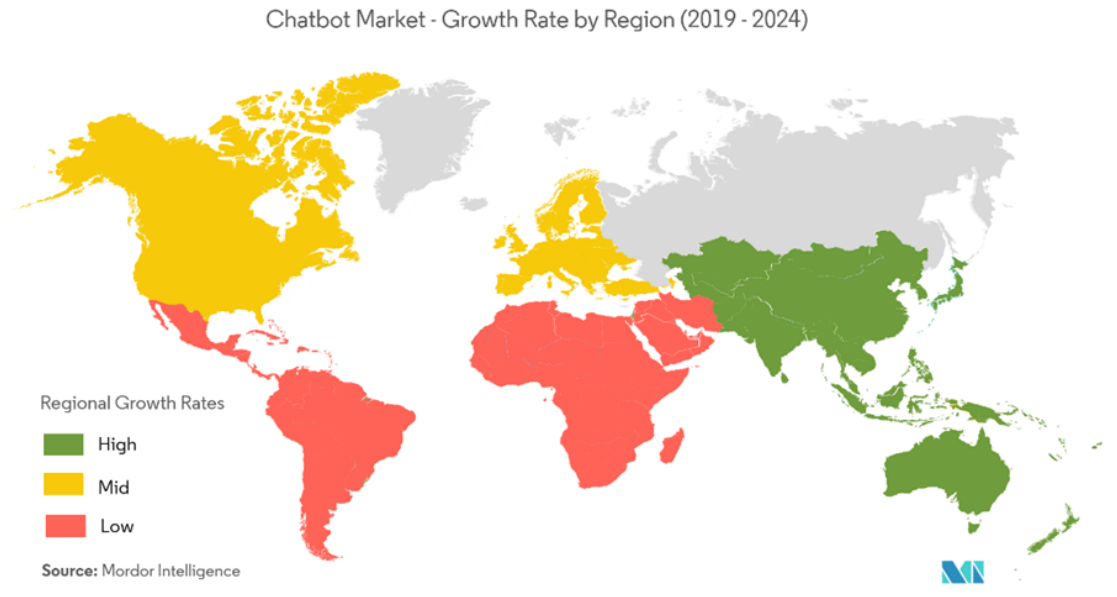


Figure 2.10: Chatbot Market-Growth Rate by Region (2019-2024)[52]

out about something, this is what you turn to first. But this is more about general knowledge. And if the user decided to pick up something personally for himself - for example, convenient train tickets or recommendations for packing a suitcase or making a diet taking into account calories, in this case, chatbots have already shown themselves to be more effective than search engines [55]. But the market does not stand still. Microsoft and Google are already adding chatbot features to their existing search engines. Last year venture capital investment in generative AI totaled over \$1bn 2.11.

IBM used its Watson Assistant chatbots to help healthcare organizations, government agencies and academic institutions around the world use AI to transmit important data and information to citizens in April 2020.

CreativeVirtual entered into a partnership agreement with Switch AG in February 2020 to provide its customers with innovative self-service solutions using the best-in-class technologies of both companies. The integration of CreativeVirtual V-Persons chatbots in natural language and Switch voice technology has created one of the industry's leading voice bot offerings [56].

As for the labor market, the customer support sector has become the most obvious probability of replacing human labor. Already, companies are cutting staff using the usual chatbot technology. Because, unlike humans, bots have infinite patience. Researchers suggest that in 5-7 years it will be very difficult to predict with whom a conversation is being conducted - with a person or with a machine.

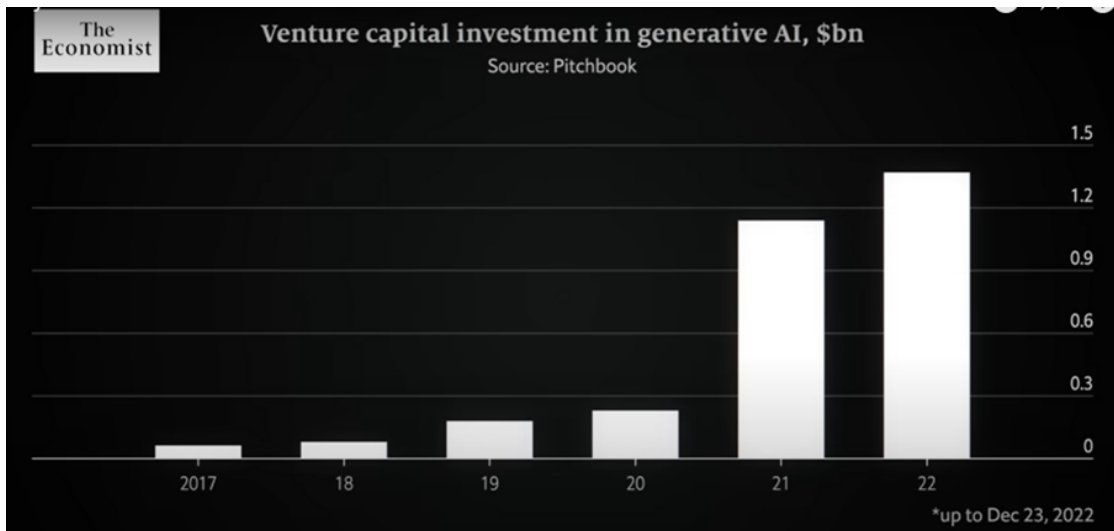


Figure 2.11: Venture Capital Investments in Generative AI[56]

To date, AI chatbots already pass the Turing test without any problems. AI chatbots can also to some extent replace teachers or help parents explain complex terms to their children 2.12. In the figure below you can see an example of the answer generated by a neural network to the question "How to explain inflation to a 4-year-old child?"

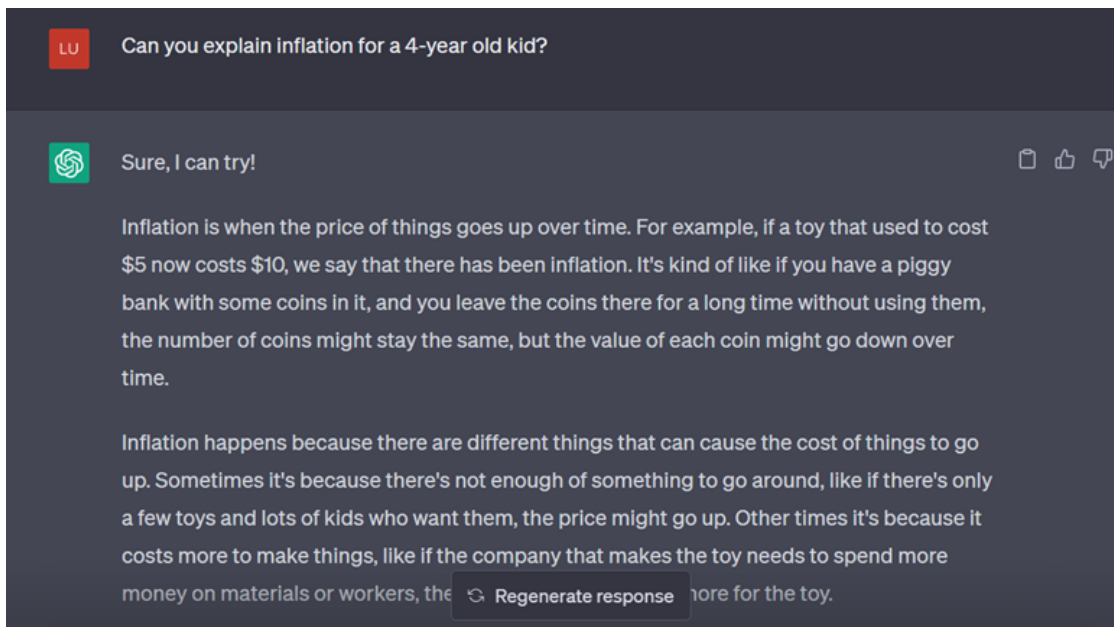


Figure 2.12: AI Chatbot as an educative tool[56]

McKinsey's report on the economic impact of AI indicates that there are negative economic consequences that should be taken into account. Some countries may face a possible widening of the gap between developing and developed markets, as well as between rich and poor as a result of the introduction of AI. In the short term, the introduction of AI may lead to minor job losses. However, in the long term, in 5-7 years, the exponential growth of AI may lead to the absorption of most jobs in certain sectors. It is possible that most people will retrain, but still, a small percentage of low-skilled workers may be out of work.

2.2.8 Implementation of AI technologies in business

To prevent possible problems in the design, implementation and use of artificial intelligence systems, managers should take into account factors that affect the user experience, such as aesthetics, the expected running time of the application, the resources consumed, as well as the level of user confidence in the government. This will avoid problems at the stage of designing applications using artificial intelligence.

To solve possible problems related to the design, implementation and use of applications based on artificial intelligence, managers should take into account factors that affect the user experience in order to prevent problems at the design stage. These factors may be related to aesthetics and user experience, time spent using artificial intelligence-based systems, and trust in government. For example, aesthetics can be improved by using colors, fonts, and shapes that match users' preferences and create a positive emotional and cognitive experience. In figure 2.13 you may find the best practices for the implementation of chatbots in a company. In addition, the time spent on using the systems should be minimal so as not to have a negative impact on the user experience. Finally, trust in government can mitigate the impact of personalization, aesthetics, and time spent on the perception of user experience.

The world of artificial intelligence is in the process of changing, and despite the problems that arise, there are several examples demonstrating a sharp transition to a world based on data and algorithms. Such examples include chatbots UNA from Latvia, Syria from the Netherlands, Tangai from Sweden and many others, which are reported in the article [57].

It is worth emphasizing that the use of AI chatbots can lead to significant changes in the structure of companies and production processes. The roles of company employees may change. AI chatbots can perform many routine tasks, which will allow employees to focus on higher-level tasks, such as strategic planning and new product development [58]. This will generally lead to an increase in production productivity. Since AI chatbots will automate production processes,

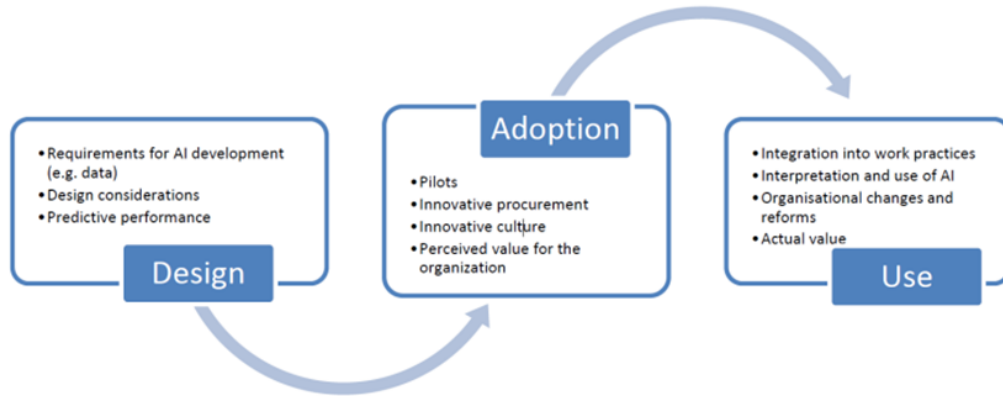


Figure 2.13: Implementation a Chatbot in a Company Scheme[56]

which can lead to increased productivity and lower production costs.

But it's not going to happen just like that. Employees of companies, in turn, will need to adapt to a new work environment and develop new competencies. To work with AI chatbots, new skills and competencies will be needed, such as understanding machine learning algorithms and the ability to analyze data [59].

As a consequence of all of the above, this will lead to a change in the structure of the team. With the advent of AI chatbots, it is possible to change the structure of the team and increase the number of specialists in the field of data and analytics [60]. And business will probably change business models and sales structure. AI chatbots can change the business models of companies, allowing them to provide services 24/7 and improve customer service.

However, this will also require businesses to strengthen data protection. With the increasing use of AI chatbots, the need for data protection increases, which may lead to a change in security policy and the need for additional training of employees [61].

Technological problems associated with the use of artificial intelligence systems include insufficient transparency of algorithms and the difficulty of understanding them, which can lead to serious problems in the event of a system failure. Users and politicians may perceive artificial intelligence technology as a "black box" without understanding its mechanisms. Managers of IT firms may believe that end users do not need to know artificial intelligence algorithms, but at the same time they do not solve the problem of insufficient knowledge of government employees who use these systems. This problem requires organizational and managerial solutions, such as professional development of civil servants, in order to eliminate the gap in their knowledge.

2.2.9 Assumption of the impact of AI chatbots on the Italian economy

Italy, as one of the largest economies in Europe, is no exception, and the question of how AI chatbots affect its economy is becoming increasingly relevant. This literature review examines articles and studies on the impact of AI chatbots on the Italian economy, including changes in the structure of the labor market, improving business efficiency and increasing the competitiveness of the country.

One of the main issues related to the introduction of AI chatbots is its impact on the labor market. Some studies show that AI can replace some types of work and reduce the need for certain professions. However, other studies indicate that AI can also create new jobs and increase productivity.

There has not been much research done on this topic in Italy, however, the article “Digitalization and the Future of Work” examines the impact of AI on the labor market. The study showed that AI can significantly affect some types of work in Italy, including work in the sales, production and services industries.

AI chatbots can significantly improve business efficiency by reducing the burden on employees and improving the quality of customer service. They can improve the quality of processing customer requests and speed up response time. In the article “The Impact of AI and Automation on the Italian Economy”, the authors consider the impact of AI on the Italian economy and give an example of increasing business productivity.

So, nowadays AI chatbots are an increasingly common tool in business and public life in Italy. They can improve the efficiency of companies, improve customer experience, and change the structure of the labor market. Many studies and articles discuss the impact of AI chatbots on the Italian economy, highlighting both positive and negative aspects of their use.

Several studies conducted in Italy emphasize that AI chatbots can improve the customer experience and increase business efficiency. In a study conducted by Accenture, it was revealed that the use of chatbots in the banking sector can reduce customer service costs by 43%. However, this indicator may vary depending on specific conditions.

However, many studies also highlight the potential negative consequences of using AI chatbots in the labor market. One study conducted by the World Economic Forum predicts that AI could replace up to 45 million jobs worldwide by 2025. At the same time, not all experts agree with this forecast and point out that the use of AI chatbots can also create new jobs related to the development and maintenance of such technologies.

According to experts, in order to maximize the potential of AI chatbots and reduce the negative impact on the labor market, it is necessary to develop appropriate strategies and policies. In particular, it is important to develop skills that will be

in demand in the new economy, such as the ability to work with AI and the ability to adapt to changes in business.

2.2.10 The potential of using AI chatbots in the Italian economy

The author sees many opportunities to use AI chatbots in the Italian economy. For example, in Italy, AI chatbots can be used in various industries, including finance, technical support, education, healthcare and tourism. For example, banks can use chatbots to process loan applications and answer customer questions. Tech companies - to provide online support and customer service. In the educational field, chatbots can be used to automatically evaluate students' work and answer questions. In healthcare, chatbots can be used to provide patients with medical information and advice.

In addition, AI chatbots have a huge potential in the Italian tourism industry to provide tourists with information about local attractions, museums and cultural events. For example, chatbots can be used in Venice to provide tourists with information about city channels and routes.

The use of AI chatbots in Italy is just beginning to grow, as they allow you to increase work efficiency and improve the quality of customer service. However, along with this, there are also risks, such as loss of jobs and violation of the privacy of customer data. In this regard, in Italy, as in other countries, studies and discussions are being conducted on the possible risks and benefits of using AI chatbots in various industries.

Never before in world history have there been so many cases when governments have published documents on the strategic development of one particular technology. Canada is a leader in this artificial intelligence journey, having published its first national strategy in 2017, followed by the United Arab Emirates. In the following years, the number of countries that followed this example increased exponentially. Although Italy lags far behind advanced countries in the field of telecommunications and digitalization, in March 2018, the AI Task Force for Digital Italy (AgID) published version 1.0 of the "White Paper on AI Serving the Citizen", based on the European Digital Agenda.

According to researchers, the rapid reduction of computing costs, the improvement of the development of the Internet and the reduction of investments in digital technologies have led to a sharp increase in the number of patents for artificial intelligence registered in various patent offices around the world. This trend has allowed small companies like Apple, Google and Facebook to surpass giants like General Electric and General Motors in the market in just 15 years.

2.3 Summary of Literature Review

So, in this chapter, a brief overview of machine learning and artificial intelligence technology was conducted. The main trends in this direction in the market both in Italy and around the world were analyzed. The conclusions based on the literature review allow us to gain a deep understanding of the impact of AI chatbots on the labor market. The development and application of AI chatbots has significant implications for the labor sphere and requires attention from employers, employees and the state. We understand that AI chatbots can perform routine and repetitive tasks, which can lead to automation of certain types of work. This can lead to a decrease in demand for certain types of work and job losses, especially where human interaction is not necessary. While some jobs can be replaced by AI chatbots, new opportunities for people are emerging. Specialists with new skills and competencies may be in demand for the development, maintenance and improvement of AI chatbots. This requires training and retraining of the workforce so that they can work effectively in the new conditions. It should be understood that AI chatbots can significantly improve the efficiency and productivity of workflows. They can quickly provide information and solve problems, which allows employees to focus on more complex and creative tasks. As a result, productivity and quality of work are improved. The introduction of AI chatbots in the labor market raises important ethical and safety issues. Topical issues of social security and ethics were also raised. The author discussed current proposals for solving ethical problems. It is also observed that society is concerned about data security when using the latest technologies. The author hopes that the analysis of the work done before this paper will help the author and the reader to better understand the general trends when communicating with experts.

Chapter 3

Methodology

3.1 Introduction to the chapter

This chapter will describe in detail the methodology of the study. The author will describe the methods she used, describe the in-depth interview, and the reasons for its use. Then a detailed plan for the selection of respondents is given in the design section of the study. A brief description of how the interview was constructed will also be given. At the end, it will be described what and how much data was collected and the analysis. The research work is mainly based on a qualitative research method. To answer the research questions in this article, the author decided to conduct an analysis based on interviews in two main areas - technology and business. The author used the snowball method to search for respondents. However, despite the standard process of recruiting respondents for the survey, it was far from an easy task to gather experts with relevant experience and meet all the criteria. A focus group of AI technology professors and business consultants in the field of innovation was assembled. The assembled focus group of experts helped the author to understand the real state of development of artificial intelligence technologies in Italy. An interview was used as a research tool. Interviews give researchers the opportunity to get a broad and in-depth assessment of specialists on a research issue. Despite the difficulties of conducting in-depth interviews (time, search for respondents), the author intentionally does not use the survey tool. Although neural networks and AI are rapidly gaining popularity, they remain a relatively new technology direction in the world. This means that there are not so many specialists in this field. Also, the survey method does not allow you to get detailed knowledge and nuances, which are the determining factors in making correct forecasts of how the labor market will develop under the influence of AI. Interviews provide complete and verified data. The interviewees are professors in the field of AI and innovation at the Polytechnic University of Turin and business

consultants in the innovative business sector. Experienced university professors helped the author to draw up a theoretical and correct plan for this process. With their participation in the project, the experts have contributed to giving the process a practical form, imposing theory on the realities of the current economy.

3.2 In-depth interview

In this work, it was decided to use the method of in-depth interviews with experts. An in-depth interview is a qualitative research method that can be used in scientific papers as a diagnosis of the causes of the problem. It involves conducting intensive individual interviews with a small number of experts to examine their points of view on a specific topic, problem, or situation. [62] Since AI chatbots are a new product for the market and are an innovation, it is necessary to assess how they will be perceived by society. The in-depth interview allows the author to identify problems and issues related to the preparation and launch of new technology on the market. And also to identify internal patterns related to the interaction of users and technology. In addition, during the interview it is possible to identify a person's nonverbal behavior, thus understanding his attitude to the object of research. The main advantage of in-depth interviews is the breadth of information they provide. With their help, one can get information hidden at first glance, which is not available to the researcher if he uses a survey or a literary review [63]. In-depth interviews are flexible. They can be presented in several ways - there is no specific format to follow. However, as with all evaluation results, the rationale and methodology of the study should be provided.

3.3 Research design

To conduct research using the in-depth interview method, the following steps must be performed

1. Identify the scope of interested experts who will be able to support the research topic and share information and draw up a portrait of the interviewee. In this case, the target group will be experts and representatives of fields and professions that may be affected by the use of AI chatbots in the labor market. These can be HR specialists, managers, IT specialists, marketers and other representatives of various industries.
2. Determine what information is needed. It is necessary to determine the main topics that will be covered in the interview, as well as the wording of specific questions. Questions can be both open and closed.

3. Make a list of experts to be interviewed. Various sources can be used to select interviewees, such as professional communities, social networks, conferences, and other events. In this study, direct letters from the author to the experts were used. Interviews can be conducted both in person and in the format of an online meeting. It is important to ensure that the interviewees were representatives of different fields and professions, their answers were diverse and covered a wide range of questions related to the topic of the study.
4. After the interview, process the results and track patterns in the responses. Special attention was paid to data analysis, taking into account certain topics and issues that were raised in the interview, and highlighting the most significant conclusions.
5. Identify trends and find answers to the questions posed in the introduction. Determining the impact of AI chatbots on the labor market, identifying the pros and cons of their use. Formulation of recommendations for the development of professions and areas affected by the use of AI chatbots.

Also, before conducting an interview, it is necessary to work out the interview protocol — the rules that the interviewer will be guided by when organizing and conducting interviews. In other words, these are instructions that should be followed at each interview to ensure consistency between interviews and thus improve the quality of results. The following instructions for the interviewer will be included in the interview protocol of this work protocol:

- Introduce yourself to the interviewee before the interview begins;
- Tell the interviewee how long the interview will last and whether there will be a recording
- Tell the interviewee how data will be stored and about privacy policies
- Concluding words at the end of the interview;
- What to do after the interview (for example: to fill out notes, to check the audio recording for clarity, to summarize key information for each).

It is also necessary to develop an interview script that lists all the questions and problem areas to be studied during the interview. In some cases, it is necessary to prepare a separate list of questions for each group of experts under study. After all the interviews, an analysis was carried out, which consisted in the following steps:

1. To decipher and evaluate the data.
2. Analyze all the interview data

3. Write a report on the main findings and conclusions
4. Request feedback from interviewees

Before taking the interviews, several hypotheses based on the research questions were given as assumptions. Such as that society's attitude to the growing popularity of chatbots with artificial intelligence is ambiguous. On the one hand, some people are excited about the convenience and efficiency that chatbots can bring to various industries, such as customer service, healthcare, and finance. Chatbots can provide fast and personalized assistance around the clock without the need for human intervention, which can save time and resources. On the other hand, there are concerns about the potential negative impact of chatbots on the labor market. Some people are concerned that the growing use of chatbots may lead to the displacement of people, especially in industries such as customer service and administrative support. In addition, there are concerns about the quality of service provided by chatbots and potential bias in their programming. In general, society's attitude to chatbots with artificial intelligence is complex and varies depending on the context and specific application. While many people see the benefits of chatbots, there is also a need to address potential negative impacts and ensure that chatbots are developed and used in an ethical and responsible manner. The author also assumed that in Italy, as in other countries, the introduction of chatbots will grow as more and more companies realize the benefits of using them. In general, it is expected that the trend of chatbots development will continue to grow worldwide, with the growth of their implementation in various industries and markets.

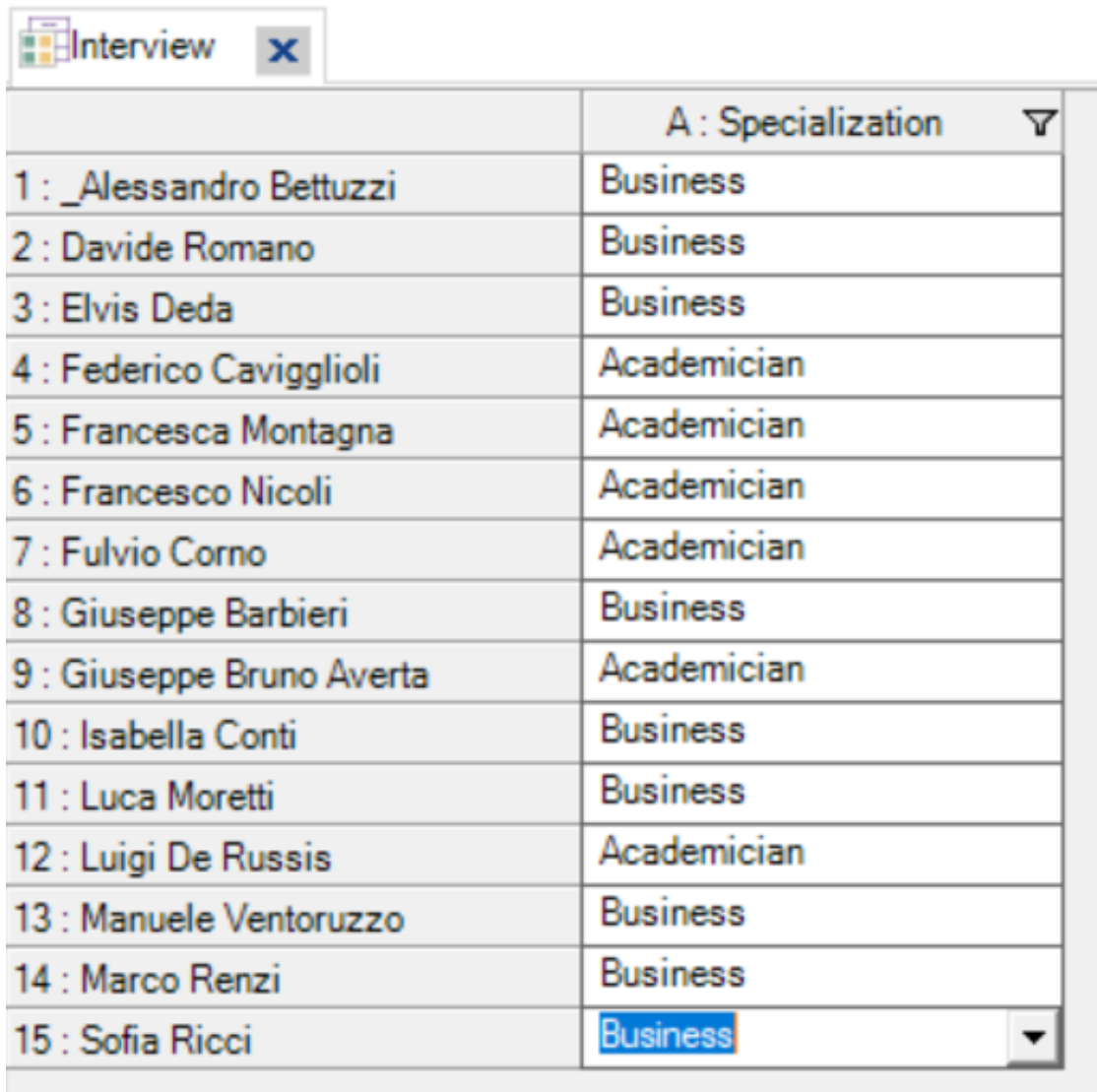
3.4 Structure of the Interviews Taken

When conducting an interview with experts, the purpose of the interview was explained first of all. The interviewee was also told why he or she was chosen as an expert and the expected duration of the interview. The consent of all interviewees was also obtained about the recording of the interview, where the information will be stored and how they will be able to access the results of the interview, as well as the final study. After the interview, key information was summarized together with the expert.

Most of the interviews were conducted in the form of a personal meeting. However, some of them are in the format of online calls. The reason why the participants chose this method of answering questions was the absence of participants in Italy at the time of the interview. The limitation of an interview in the form of online calls is that the respondent gives a detailed answer in one phrase, after which he waits for the next question. At the same time, it can be difficult for all of us as an interviewer to catch nonverbal signs. Because of this, some details of the study

may be lost. Data on respondents and candidates for the study were selected in the period from March 2023 to June 2023. The respondents were selected according to several criteria: participation and contribution to AI and innovation projects, the amount of time and experience in this field, the direction of work, scientific publications, reports or participation in business projects on AI topics. Given the fact that not all respondents were in Italy, it was decided to conduct some interviews online. At the time of writing this article, fifteen experts from the selected focus group participated in the study. The sample consisted of experts aged 31-47 years. The majority of experts (60%) are experts that work in the business and production field, rather than academic (fig. 3.1 and fig.3.2).

The interview was divided into three blocks. The in-depth interview lasted from 30 to 45 minutes and consisted of 15 questions. The interview was divided into 3 parts. This is an introduction in which the expert needs to introduce himself, tell his occupation and tell how he currently interacts with AI chatbots. The second part is the main one. It discusses the views of society on the latest developments in the field of AI chatbots, the problems that will have to be faced in the market and possible ways to solve them. The third and final part discusses future trends in the use of chatbots in the world and in Italy and their possible impact on the labor market. 15 interviewees from different research fields were selected to conduct the study. Interviews were conducted with professors of the Polytechnic University of Turin in the field of computer technology, in particular AI and computer-human interaction. Experts in the field of business consulting were also selected. People who advise companies on the implementation of IT and AI technologies and Machine Learning specialists. The author also conducted an interview with an expert in the field of AI and politics. At the same time, experts in the field of business consultancy were asked additional questions with a proposal to assess which professions are at the greatest risk. This was done because these experts have the most information about the market and can more accurately determine its trends. All interviews were recorded either in audio or video format. After collecting all the interviews, an analysis was carried out. All interviews were transcribed using an AI-based transcriber - Whisper AI, which was also developed by Open AI. The interview data were analyzed using the Nvivo interview tool and a documentary analysis was carried out. In the "Findings" section, the author examines in detail the main findings and conclusions. When choosing interviewees, the author took into account the sample that best reflects the various stakeholders and the opinions of these stakeholders. As part of the research object, the author tried to choose the most diverse interview participants. The main rule that the author used when conducting interviews is to monitor the moment of repetition of information. This indicates that the maximum number of interviewees has been reached. Following the interview, the next phase involved a thorough analysis of the transcribed data using a document analysis tool in the Nvivo program. The



	A : Specialization
1 : _Alessandro Bettuzzi	Business
2 : Davide Romano	Business
3 : Elvis Deda	Business
4 : Federico Caviglioli	Academician
5 : Francesca Montagna	Academician
6 : Francesco Nicoli	Academician
7 : Fulvio Corno	Academician
8 : Giuseppe Barbieri	Business
9 : Giuseppe Bruno Averta	Academician
10 : Isabella Conti	Business
11 : Luca Moretti	Business
12 : Luigi De Russis	Academician
13 : Manuele Ventoruzzo	Business
14 : Marco Renzi	Business
15 : Sofia Ricci	Business

Figure 3.1: Fields of occupation of the respondents (Built with Nvivo)

process began by identifying recurring themes and ideas from the respondent's answers to the author's questions. At the beginning of the work, all the interview files were entered into the program (fig.3.3). So far, the author's work has not been done with them and at the moment they are raw documents after transcription.

Further, in order to separate the words of the author and the words of the respondent in the program, cases were created. In NVivo, cases are represented as nodes that serve as "units of observation." These nodes can encompass various entities within the project, such as individuals that had been interviewed, communities

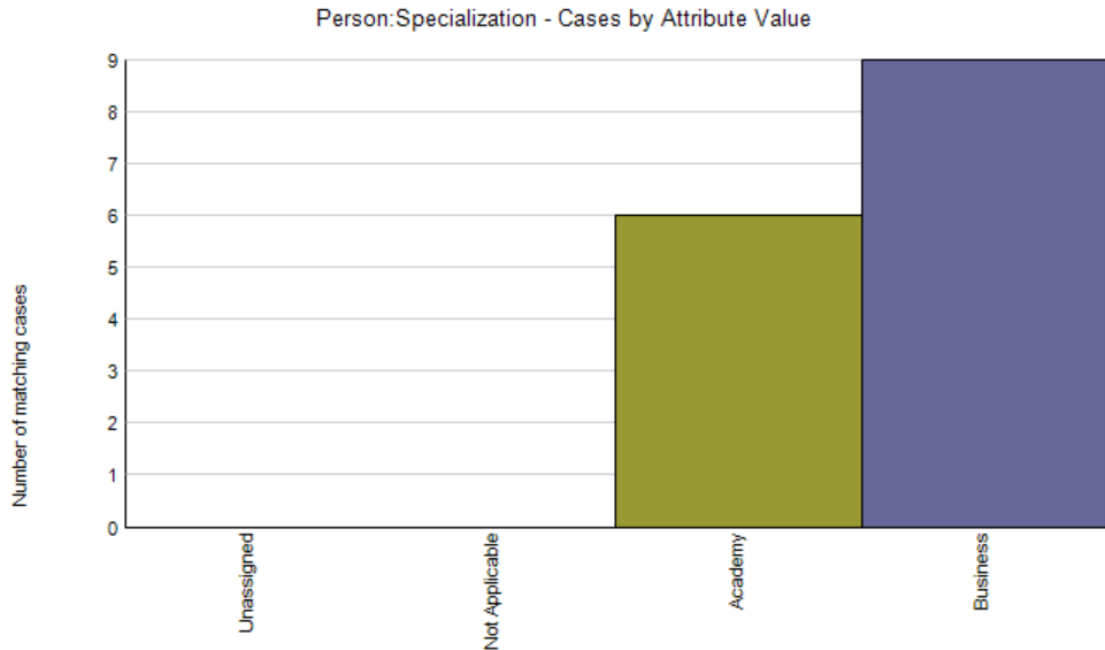


Figure 3.2: Fields of occupation of the respondents (graph) (Built with Nvivo)

Interviews						Search Project
Name	Codes	References	Modified On	Modified By	Classification	
Alessandro Bettuzzi		0	7/3/2023 10:29 PM	LSH		
Davide Romano		0	7/3/2023 10:29 PM	LSH		
Elvis Deda		0	7/3/2023 10:29 PM	LSH		
Federico Caviglioli		0	7/3/2023 10:29 PM	LSH		
Francesca Montagna		0	7/3/2023 10:29 PM	LSH		
Francesco Nicoli		0	7/3/2023 10:29 PM	LSH		
Fulvio Corno		0	7/3/2023 10:29 PM	LSH		
Giuseppe Barbieri		0	7/3/2023 10:29 PM	LSH		
Giuseppe Bruno Aver		0	7/3/2023 10:29 PM	LSH		
Isabella Conti		0	7/3/2023 10:29 PM	LSH		
Luca Moretti		0	7/3/2023 10:29 PM	LSH		
Luigi De Russis		0	7/3/2023 10:29 PM	LSH		
Manuele Ventoruzzo		0	7/3/2023 10:29 PM	LSH		
Marco Renzi		0	7/3/2023 10:29 PM	LSH		
Sofia Ricci		0	7/3/2023 10:29 PM	LSH		

Figure 3.3: Uploaded raw materials (Built with Nvivo)

studied, organizations, events, or other relevant elements. All the respondents' words are placed in specially created cases for them. This was also done in order to ensure the correct operation of the program in the future in the process of plotting (fig 3.4).

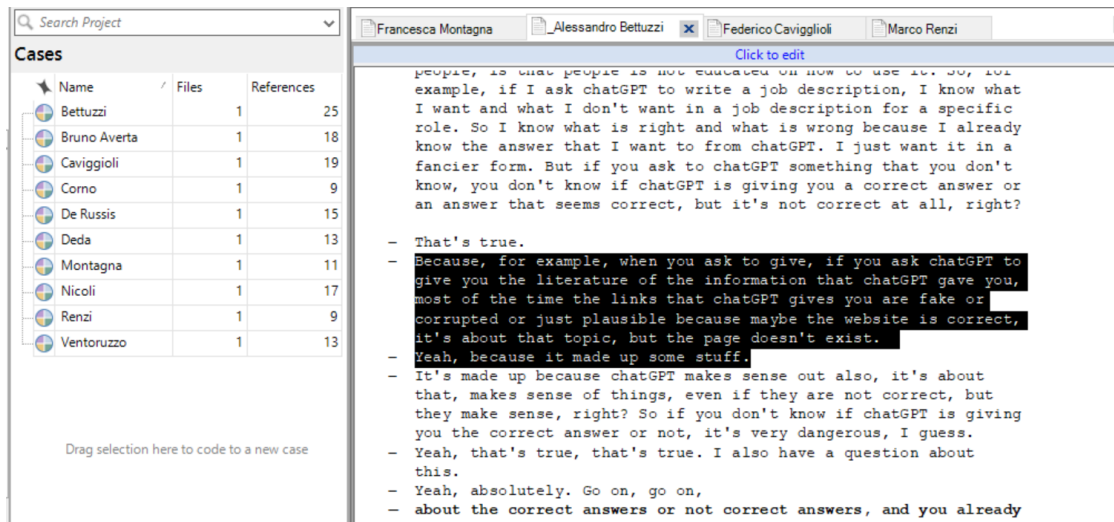


Figure 3.4: Casing process (Built with Nvivo)

A code in NVivo refers to a collection of references from various files related to a specific theme, topic, concept, idea, or experience. These codes can be either descriptive or analytical in nature. During the research process, an author may already have identified the topics they wish to explore, or they may discover emerging themes as they code the files. In my case, I have chosen the latter option.

To gather references on a specific theme, I coded relevant content from my files, including documents, datasets, pictures, videos, and audio recordings, under a designated node. For instance, while exploring my files, I coded any content related to the "AI social impact" theme under the code "Social." By accessing the node, I can conveniently view all the references related to this theme in one place. You can find the coding process on the fig. 3.5

The resulting codes were then reviewed, consolidated, and examined by the author to draw meaningful insights from the study.

3.5 Limitations

An in-depth interview is a qualitative research method that allows you to get detailed information about people's opinions, experiences, and views. However, like any method, it has its limitations. One of them is a limited sample size. 15 respondents took part in this study. But since in-depth interviews require time and resources, the number of respondents was limited from 20 to 15. As a result, the sample may not be representative and may not allow generalizing the data obtained to the entire target audience. Also, one of the vulnerabilities of the interview as a research method is subjectivity. The results that the author received in this study

Chapter 4

Results and Discussion

4.1 Introduction to the chapter

This chapter aims to uncover commonalities in the opinions and responses of the interviewees. The author observes general trends regarding views on the development of AI and its impact on the labor market. Additionally, examples are provided from other countries' experiences, with which Italy collaborates on neural network technology development. The author analyzes each question from the interview and provides their evaluation and overall conclusions obtained through document analysis of the expert interviews. The author correlates the speakers and their respective viewpoints with specific quotations. The methodology of the study, as well as the results discussion, rely on document analysis. The AI industry's development is assessed in terms of potential benefits or losses for employees. After the interview, new ideas were discovered, which were not previously assumed by the author.

4.2 Main findings

4.2.1 Part 1. Introduction

Almost all respondents answered that they use AI chatbots for their everyday routine tasks. Here are some replies:

*- I use chatGPT basically daily right now. So I use it constantly. Most of them regard the **production of content**. So I don't know if I have to, for example, **write a job description** or if I have to write a work announcement or if I have **to make a skill map**. So anything that regards producing content or creating some material, I use chatGPT for that.*

- *I use it even in Italy, even outside of it for different types of projects. For example, in my case, I need **to construct a logic in an application**, or something else in database, you know, algorithm without spending time using Bing, Tech.co, Google or websites through this search engine. ChatGPT has this kind of ability that in my case, it provides me the specific information that I require.*

- *I use ChatGPT as a **tool for market research**, identifying potential problems, and finding solutions. In addition, I can use ChatGPT **to get tips on marketing, HR management, finance** and other aspects of the business.*

- ***Answering email sometimes.** So for those emails that are basically not spam, but require an answer. And also for, you know, re-elaborating some answers or some texts that I just wrote bullet points and I want to make them more fancy and elegant or structured.*

- *And also for, I call them solo brainstorming. So if I have to brainstorm on something, I ask chatGPT **to brainstorm with me** in a sense. So if I have, I don't know, I need 10 ideas for a company retreat, right? For example. So instead of thinking by myself, I ask chatGPT and then I, you know, build up on those propositions that chatGPT proposed to me.*

- *For me, it was very, very useful, mostly **constructing new logic and having algorithm formulas** available to me much faster and even explaining to me how to apply or how to use it or what it's for, you know?*

4.2.2 Part 2. Main problems

What are the main concerns of people (employees) when it comes to such technology as AI chatbots?

Having received the respondents' answers, the author observes that there are several concerns that people, especially employees, may have when it comes to chatbots with artificial intelligence. One of these problems is the potential loss of jobs. As artificial intelligence chatbots become more advanced, there are concerns that they could replace human workers, leading to job displacement and unemployment. In addition, employees may be concerned about the quality of service provided by chatbots with artificial intelligence, as they may not be able to provide the same level of personalized or trustworthy information as human employee. There may also be concerns about privacy and data security, as chatbots with artificial intelligence collect and analyze huge amounts of user data. Finally, some employees may simply feel uncomfortable or awkward when interacting with chatbots with artificial intelligence, preferring human interaction instead (fig. 4.1).

Name	Files	References
Socio	0	0
Data security	8	15
People's concerns	1	5
Enthusiasm	4	5
Resistance, fear	7	11

Figure 4.1: Socio concerns (Built with Nvivo)

- I mean, of course there is a concern for **data privacy**. So using, you know, giving chatGPT sensible data or information about, for example, I don't know, the company or any information that are very specific. There is a concern of how might they be stored or used for other purposes, for example.

- Because, for example, when you ask to give, if you ask chatGPT to give you the literature of the information that chatGPT gave you, most of the time the links that chatGPT gives you are **fake or corrupted or just plausible** because maybe the website is correct, it's about that topic, but the page doesn't exist.

- So if **you don't know if chatGPT is giving you the correct answer or not**, it's very dangerous, I guess.

- So the two reactions that I find for chatGPT is fear on one side, like **I will lose my job** or chatGPT will take our jobs, or absolutely **enthusiastic**,

-...each of these **jobs that can be automated are of course in danger** for the new developments in technology, but that should not be seen as like in individual point of view that I will lose a job or somebody else will lose the job because the economy doesn't work like that. Of course, the first years, **the first decade or the first 20-30 years will be lots of jobs losses when technology is deployed**, but right after that, I'm speaking for democratic countries, they have self-regulatory processes because it's always a chain reaction, the economy might change something and replace it with something else.

- It's the fear that during this kind of interaction with the technology, **they might create a profile for you**, the same that does, for example, Google when you search, YouTube when you search, Amazon, Instagram, everything.

...it gathers the information from all of these people and it uses it in order to get better, to get faster. To learn, basically.

Can people have a resistance towards AI chatbots - why and how can we work with it?

As expected, people may experience resistance to chatbots with artificial intelligence. This can happen for several reasons. One of the main reasons is the fear of losing your job due to automation. There may also be concerns about the accuracy and reliability of artificial intelligence chatbots, especially in industries where errors can have serious consequences.

- Absolutely. People don't want to use it. There are two reactions... ..So they are afraid, but they don't really know that they are already selling their data for free to many different companies. So it's kind of just the last thing to be afraid of. And the second thing is they are afraid they will lose their job because they see it like a technological disruption as we saw for the steam production and the machinery in the early of the previous century, right?

One of the most common reasons why people may be afraid and avoid this technology is the privacy of data and their use. This was stated by 8 respondents in 15 different forms (fig. 4.1). People do not know how and for what purposes their data will be used, as well as how the data will be kept.

- And for the people that are scared, they are scared about two things. One is how this data will be used and how it will be processed...

...And regarding the specific technology that we are seeing now, ChatGPT, it's always about the privacy of the data.

...It's the fear that during this kind of interaction with the technology, they might create a profile for you...

...If you move on in terms of age, you could find people worried more about the problem of data management Mm-hmm And therefore the use of the data that this kind of technologies do...

It is also very interesting to look at word cloud based on the words about data privacy that were said by experts (fig. 4.2).

GPT-derived tools will really help when they are fine-tuned on the documents of an individual company. They are retrained, the tool is retrained on a document on an individual company. You can already do that, but you need to upload your

Another approach is to involve people in the development process and encourage feedback. This can help build trust in the technology, as people see that their problems are being solved and that artificial intelligence chatbots are being developed to meet their needs. By involving employees in this process, companies can also help reduce resistance and increase the level of implementation. In general, eliminating problems and informing people about the benefits of chatbots with artificial intelligence, involving them in the development process and creating user-friendly and effective chatbots can help reduce resistance and increase implementation rates. But there were also respondents who believe that the appearance of chatbots on the market also provokes people's enthusiasm. People decide that without education they can get one of the professions with the help of an AI chatbot, but this is not the case.

*- it's also creating enthusiasm, right? I mean, there are people that say, oh my god, I can do so many things. Like **I can be a programmer right now. No, you can't.** I mean, you don't know how chatGPT works because it's not that you can create the new Harry Potter or the new Lord of the Rings because you will ask just chatGPT to write that. chatGPT can just make sense of information that is given. If chatGPT doesn't have an answer, because that problem has never been solved on Stack Overflow, I'll doubt it, but it could be possible, chatGPT will try to give you still an answer because it's built for giving you an answer in any case. It's not built for saying, I don't know. And so this is the same ignorance. So you think you can be a programmer? No, you can't. Because most of the time the code that chatGPT gives you is broken and needs to be fixed manually. **It makes you a faster developer, absolutely. But it will not make you something that you are not.***

The majority of respondents expressed their position that AI chatbots serve as a facilitator of current work and tasks, rather than a complete substitute for an employee. It can be noticed on the fig. 4.3 and fig. 4.4.

Name	Files	References
Role	0	0
Employee Substitute	3	3
Facilitator, tool	6	15

Figure 4.3: Role of AI chatbots nowadays (Built with Nvivo)

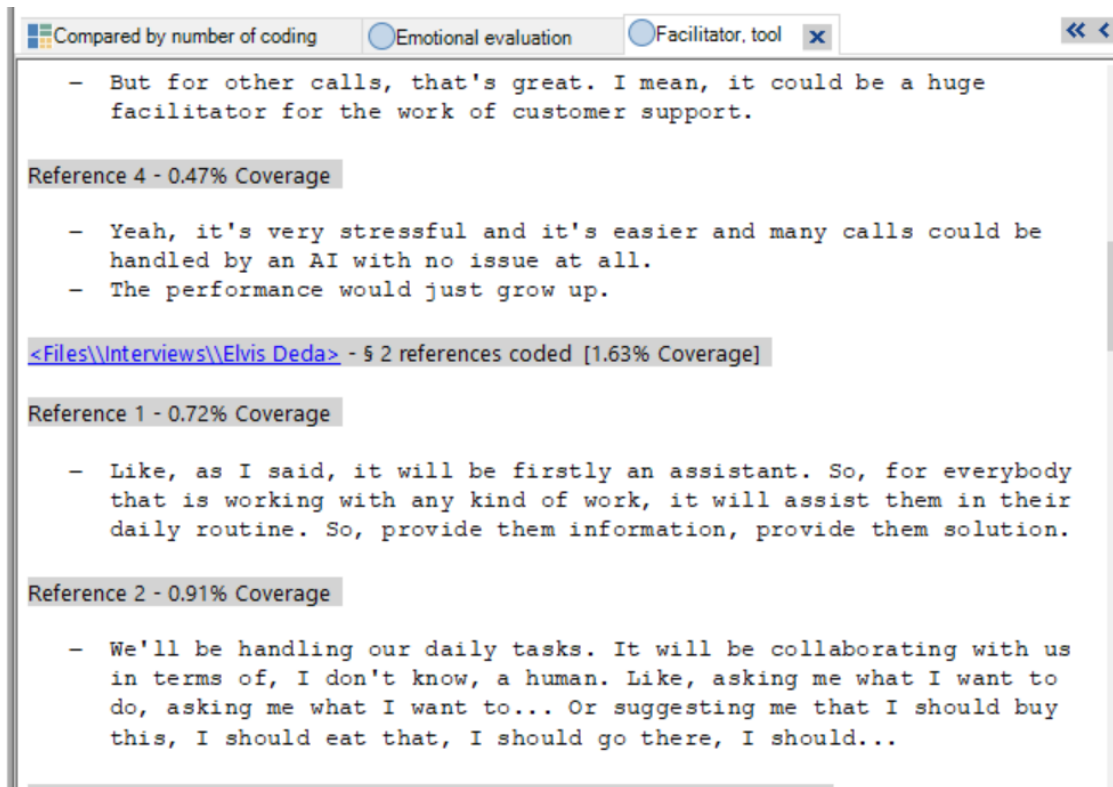


Figure 4.4: Facilitator codes (Built with Nvivo)

Do general people understand what AI and chatbots are and how do they work? Maybe the fear is based on ignorance?

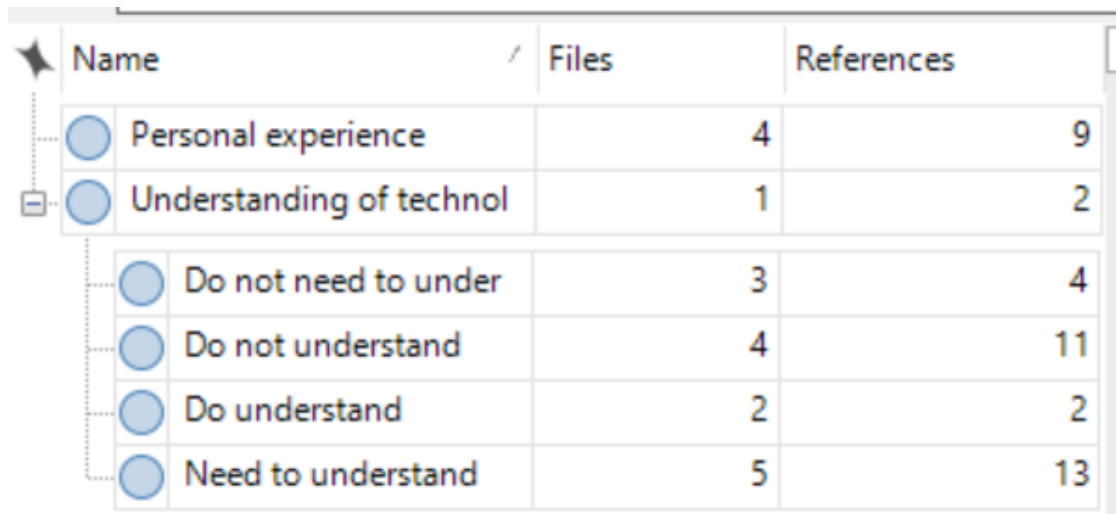
The level of understanding of the work of artificial intelligence and chatbots varies from person to person. Some may have a basic understanding of what artificial intelligence is and how it works, while others may know almost nothing about this technology. Similarly, some people may be familiar with chatbots and how they work, while others may not be aware of their existence. There are several factors that can affect a person's understanding of artificial intelligence and chatbots, such as education, age, profession and cultural background. Those who work in technology or related fields may have a better understanding of artificial intelligence and chatbots, while those who don't may not be as familiar with the technology. To improve the general understanding of artificial intelligence and chatbots, it is important to provide educational programs to the public. This could be done through seminars, online courses, or educational materials such as videos and articles. It is also important to make sure that the information provided is presented in such a way that it is easily understandable and correlated with an ordinary person. In addition, creating user-friendly interfaces and designs can also help demystify

technology and make it more accessible to people who may not have a technical background. By making artificial intelligence and chatbots more accessible and understandable, people may be more willing to interact with technology and enjoy its benefits.

-It's always the thing, you know, in psychology there is the real perception of risk or the perception of danger and the actual danger.

-They don't know how it works. And this is creating fear.

Respondents believe that most people do not understand the technology of AI chatbots. And at the same time, experts are very concerned about the education of people and believe that it is necessary to consciously use chatbots and understand exactly what information needs to be found. Since AI chatbots can often create hallucinations in order to satisfy the user and give an answer, which can be dangerous for a user who does not understand what information he or she is looking for. On the other hand, some experts expressed their point of view that it is absolutely not necessary for users to understand the mathematical models on which the technology is built, it is enough to approach working with the tool quite consciously.



Name	Files	References
Personal experience	4	9
Understanding of technol	1	2
Do not need to under	3	4
Do not understand	4	11
Do understand	2	2
Need to understand	5	13

Figure 4.5: Understanding of technology (Built with Nvivo)

How can you distinguish who gave the answer - a person or a chatbot?

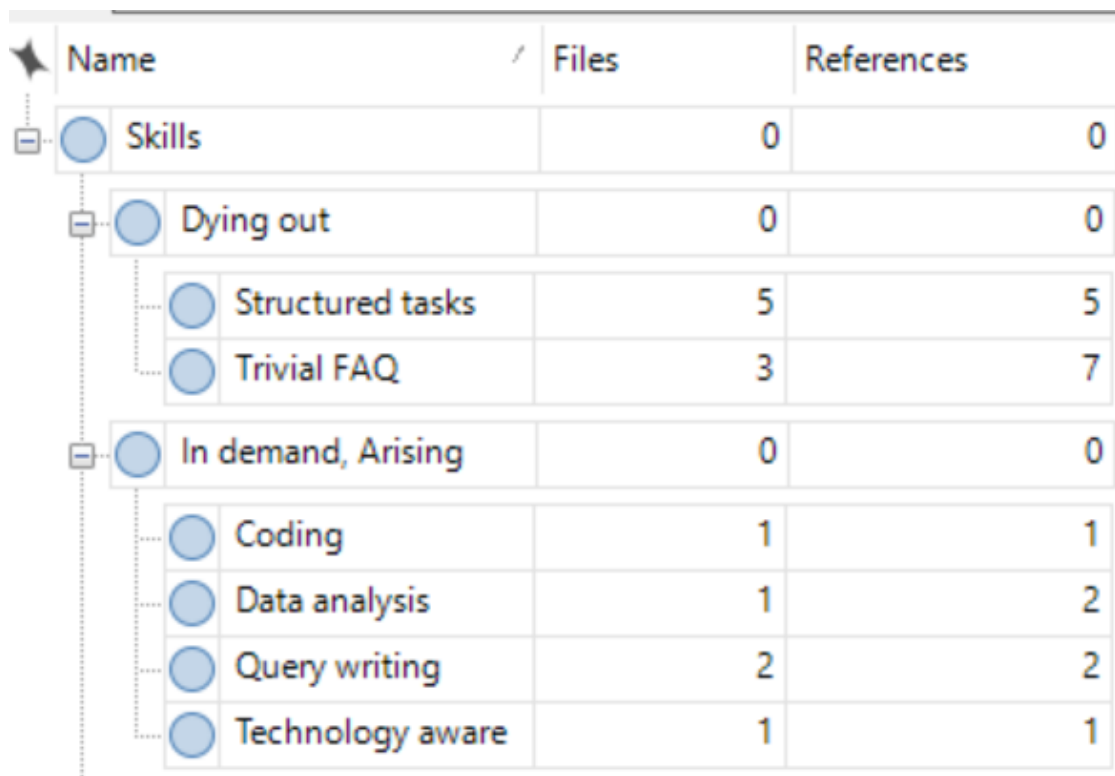
*- I think that it's because of the semantics that are used. I mean, they are quite I mean, they are quite **too clean and impersonal and ascetic**, you know*

- chatGPT has a way of answering that is **complete, methodic, ordered**. And a bit boring. It's **super clean and impeccable** in a sense.

- Hmm.. I would say they are more **clinical**, there are **no words that are emotionally connotated**. Mm. So it's not, it gives the notion, but not the emotion associated with it, with the person

In general, it should be taken into account that AI chatbots cannot replace human communication, which is based on emotional intelligence and the ability to understand human emotions and needs. In some cases, it can be difficult to determine whether the answer was given by a person or a chatbot. However, there are several ways to determine whether the response is generated by a chatbot or a human. Chatbots may not be able to understand complex or abstract questions or statements, while humans tend to be able to understand more subtle language and respond to it.

On figure 4.6 you can see which human skills can be replaced by a chatbot, which skills will need to be learned, and which of them are irreplaceable



Name	Files	References
Skills	0	0
Dying out	0	0
Structured tasks	5	5
Trivial FAQ	3	7
In demand, Arising	0	0
Coding	1	1
Data analysis	1	2
Query writing	2	2
Technology aware	1	1

Figure 4.6: Skills (Built with Nvivo)

-...I will know that is not the perfect answer because **chatGPT goes out of**

focus, for example, and your answer is not perfect.... if any other person is as lazy as you making chatGPT provide the same answer.... It can have a variation, but the structure will be for sure the same. So if I have three person that use chatGPT for answering the questions, I will know for sure.

But what about the psychological aspect that it is more pleasant for a person to work and talk with a person, and not with a machine?

... there are some chatbot already that ask you, do you want to talk with a real person or the answer satisfied you? And if you answer yes, you will be redirected to a real person that can see all the information that the chatbot already gave you.

...I can't be reassured by a robot right now. So I need to talk with a person because it makes me feel listened and heard and maybe I trust more the fact that that person understood correctly what I'm saying rather than not. It's just a feeling but people are irrational in a sense.

But there were also respondents who believed that in the field of customer support, on the contrary, it is more pleasant to work with a chatbot. Because it causes less stress and AI chatbots most likely know the answer and will be able to provide them with a client in a few seconds. This way you don't have to wait in the call queue while all the assistants are busy.

*- you would have all the information about the most, you can feed the chatbot all the answers to all the questions that were ever asked to the customer support and it will have an answer for that. **That's more reliable.***

*- I think there are some issues and some fields and some topics in which you want to interact with another person. But there is always the conundrum of even if I talk with a person, a real person in customer service, **maybe that person wasn't trained so well and so he doesn't answer my questions** or he doesn't have the correct answer for me. So maybe this gives me an extra dose of stress.*

However, the question of whether an AI chatbot can replace a recruiter was answered in the negative. Because the recruiter's work also has an emotional aspect and an emotional assessment of the candidate. Since these actions are incomprehensible to the machine and it is not yet possible to explain it mathematically, the robot will not be able to perform these functions (fig. 4.6).

Why should we trust the answers that a chatbot gave us, because they may also be wrong?

Chatbots always rely on pre-programmed responses based on algorithms, and their accuracy depends on the quality of programming and the amount of data they have been trained on. While chatbots can be useful in providing quick and effective responses to common queries, they are not infallible and can make mistakes. Therefore, it is important to check the information provided by the chatbot, especially if the request is important or complex.

To minimize the risk of relying on incorrect information from chatbots, it is important to double-check the information provided by the chatbot with other sources, such as official websites, customer support representatives or experts in the field.

Ultimately, the decision to trust the answers provided by the chatbot depends on the nature of the request and the consequences of incorrect information. For routine queries, chatbots can be a reliable and effective source of information. However, for more complex or important issues, it is important to check the information provided by the chatbot and, if necessary, turn to additional sources of information.

What problems (technical, cultural, social) may arise when transferring companies to AI technologies?

Experts have identified several potential problems that may arise when companies switch to artificial intelligence technologies, including technical, cultural and social problems.

Technical problems may include problems with data quality and integrity, difficulties with integrating artificial intelligence systems with existing IT infrastructure, as well as problems with the reliability and scalability of the system. Artificial intelligence systems rely heavily on high-quality data, so it can be difficult for companies that do not have clean and well-structured datasets to achieve good results using artificial intelligence. In addition, integrating artificial intelligence systems with existing IT infrastructure can be challenging, and compatibility issues with legacy systems may arise. Finally, artificial intelligence systems can be prone to errors and failures, which can have serious consequences for companies that rely on them.

*- I think that the technical problems that organizations face when implementing artificial intelligence systems include problems with **data quality and integrity**. That is, in my experience, these are difficulties in integrating artificial intelligence with the existing IT infrastructure, as well as **problems of scalability and reliability**.*

- **Compatibility issues with legacy systems** and integration of artificial intelligence with existing IT infrastructure

Cultural problems may arise due to resistance from employees who are not familiar with artificial intelligence technologies or do not feel comfortable using them. This may be due to insufficient training or understanding of the potential benefits of artificial intelligence. There may also be concerns about job changes or the impact of artificial intelligence on workplace culture and dynamics.

- Well, you know, it can be a serious obstacle when it comes to implementing artificial intelligence technologies. **Resistance from employees** who are not familiar with artificial intelligence or who are **uncomfortable using it** is a common problem. We discussed this already before, people may be afraid, people may not trust, people may strike, and so on... This may be due to **insufficient training** or not fully understanding the advantages of artificial intelligence.

- people are often **afraid of something new**. Well, that is, to introduce technology into a company, it's like a mini version, a prototype of when we introduce technology into society as a whole. When we talk about the company and social problems, I think that this is the same as talking about society in general and how they relate to it

Social problems may arise if artificial intelligence systems are perceived as a threat to privacy, security or other values important to society. There may also be ethical issues related to the use of artificial intelligence in decision-making processes, especially if these decisions have a significant impact on people's lives.

- It is necessary not to approach this from one side, yeah, but to consider it as a whole. We not only implement the system and take care of technical problems, but we also think about employees. We are coming up with some kind of **support and training programs** there... We also give them the right to vote, to participate in a survey, what they think about it and how they would like participate.

To mitigate these potential problems, companies should adopt a holistic approach to the implementation of artificial intelligence, taking into account technical, cultural and social aspects. This may include investing in employee training programs, engaging in transparent and open communication about artificial intelligence systems and their potential impact, and prioritizing ethical considerations in the development and implementation of artificial intelligence systems.

How do you ensure the security and privacy of user data in chatbots?

- As ordinary people, we can pay attention to data security at all stages of the chatbot lifecycle, for example during their transmission, storage and processing. I

would also probably recommend **proven and reliable platforms** for creating a chatbot that ensures data security and comply with legal requirements.

- These are large corporations that have this data. The process has already been launched and as one person, there is little we can do to influence it. I would advise you **to limit the amount of personal information you provide to the chatbot.**

- Data protection is a process that requires constant monitoring and updating. It is necessary **to monitor changes in legislation and update your systems accordingly**, right? In addition, it is worth **educating users about security rules when using chatbots**, for example, not to transmit confidential information, not to click on suspicious links and not to give access to their accounts. We do this every year in [our company]

- Ensuring the security and confidentiality of user data in chatbots is crucial to maintaining trust and preventing potential violations. And it is not always obvious to us how our data can be used. This may increase distrust of new technologies. But users can take several steps available to them.
- Try to use two-factor or biometric authentication in those systems where our sensitive data is stored.
- To study how the company's policies for storing user data are implemented. Access to this data should be restricted only by authorized personnel and this should be indicated in the data privacy policy.
- It is also necessary to constantly update the chatbot with the latest security fixes and software updates. This can help prevent potential vulnerabilities from being exploited by attackers.

In general, ensuring the security and confidentiality of user data in chatbots requires a multifaceted approach combining technical solutions with clear policies and procedures.

Meanwhile, the shortcomings of AI chatbots were also revealed. For example, limited functionality. Chatbots can only perform a certain set of tasks, which limits their functionality and capabilities. Limited adaptability. Chatbots may have a limited ability to adapt to changing conditions and requirements, which may lead to insufficient efficiency.

Insufficient accuracy and quality. Chatbots can sometimes give incorrect answers or respond inadequately to requests, which can affect the quality of customer service. Limited context. Chatbots may have limited context in the field of knowledge and expertise, which may reduce their ability to solve complex tasks.

4.2.3 Part 3. Future trends

How do you ensure the security and privacy of user data in chatbots?

Based on the respondents' answers, the author can identify several following ways to increase human interaction with chatbots. For example, personalizing a chatbot's interaction with users can make them feel more connected to the bot. This can be achieved by using the user's name, asking him questions about their preferences and interests, and adapting the conversation to his needs.

- ...so that they feel that they are not **communicating** with some kind of technology, but **with their friend**. So that this assistant not only performs work tasks, you know, but also asks how a person prefers to conduct a dialogue, for example, in what character to communicate or ask about the mood. Or you can also set some specific settings, sorry for reputation, **to adapt to the user themselves**. So let's say, I would create some kind of **individual experience** for each user

It is also important that the chatbot messages are simple to understand and straightforward. It is better to avoid using technical terms or complex sentences that can confuse the user.

- In general, users also need to be taught how to communicate with them. That is, you still need to understand that this is a person and try to **simplify your sentences**, but I honestly think it's more like a question of user education

One of the interesting comments was the suggestion to add visual elements such as images, videos or emoticons. This can make the conversation more exciting and interesting for the user. It is also possible to include interactive elements such as quizzes, games or surveys, which can make the conversation more interactive and engaging for the user. Or If you integrate a chatbot with other channels, such as social networks, email, or messaging apps, it can increase user engagement and reach a wider audience.

- Oh, I'm also thinking right now that I would probably add some **interactive or visual effects**, you know. Well, for example, now you can just have a text dialogue, he does not understand **pictures or audio**... We use other chatbots for this, yes... But I would combine it into one. Of course, I understand that this is a matter of technology, but now it's just using my imagination

For their part, developers need to constantly improve the technology of the functionality and content of the chatbot based on user feedback can increase user engagement and satisfaction.

By implementing these strategies, chatbot developers can increase user engagement

and create a more enjoyable and rewarding experience for their users. However, there were also experts who believe that there is no need to increase the interaction between people and chatbots. People are already very passionate about the new technology but have not fully investigated the consequences of its careless use. According to experts, the interaction between frequencies and people will occur naturally without additional intervention.

Which areas and professions will be most vulnerable in case of the widespread introduction of AI chatbots in the labor market?

The introduction of AI chatbots in the labor market can have the greatest impact on professions that are currently performed using manual labor and have repetitive tasks. Some of these professions may include contact center operators, administrative assistants, as well as employees in the field of customer service and technical infrastructure support.

- The less creative a profession is, the more susceptible they are to automation. We cannot replace programmers now, yeah, because their work, is constant creativity. But as I said before, customer support is now the most dangerous link. That's why all technology is created to give people freedom to think, to give them time for creativity; that's the whole point

*- I would guess, as is usually the case, that probably the quickest to be replaced are those professions where we have **some simple monotonous tasks or those tasks that can be scheduled as an instruction***

Professions where knowledge of certain rules and procedures is required, which can easily be replaced by AI chatbots, may also suffer. For example, in some jurisdictions there are already bots-lawyers who can help in the preparation of letters of claim, drafting contracts and other legal documents.

However, it is worth noting that AI chatbots can also create new jobs that require skills related to the development, management and maintenance of such systems. Therefore, we are not talking about replacing all jobs with AI chatbots, but about the need to reorient and retrain the workforce to more complex and highly skilled jobs.

- and yes, there will be replacements of people and losses for a while, but you have to understand that this has happened before in history. This is done for development, not to kick people out for nothing, but to enable other tasks. But people have to constantly learn new things for that, people often don't want to do that

On figure 4.7 you can see which professions are at the greatest risk, and which professions may be needed in the future

Professions	0	0
At risk	0	0
Customer Support	3	4
Manager Assistant	2	2
New or in demand	0	0
AI System Maintai	2	2
Data Analysts	1	1
Fact checking exp	1	2
Prompt Engineer	3	4
Staff Trainer	1	1

Figure 4.7: Professions (Built with Nvivo)

What new jobs will be created?

As the use of chatbots becomes more common, the need for professionals to train and control them will increase. It is likely that a new profession may appear, the so-called "Staff Trainer". Staff trainers will be responsible for teaching people how to interact with chatbots.

It is also likely that vice-versa professions may appear - the so-called "chatbot coach". Chatbot trainers will be responsible for teaching chatbots how to interact with people and respond to their requests.

*- ... definitely need people who know **how to talk to machines**, we will need people who will **train other people to use the chatbot tool**. It was when computers became ubiquitous that there were a lot of coaches teaching how to use computers. I think in this case there will be something similar, maybe called a coach.*

The profession of a data analyst will only strengthen its position in the market. An increasing demand is expected for this profession. With the increasing use of

chatbots, the amount of data generated by them will also increase. Data analysts will have to analyze this data and provide analytical information to enterprises.

- ***Analysts will definitely be needed***, as a consultant I see a shortage of such specialists in the market and they will not go anywhere with the arrival of technology

- ...more resources that will be able to ***work with the data*** in terms of processing it and explaining it to other employees

- But for example from those professions that we already have on the market, I would say that for example ***analysts***, they are likely to be even more in demand, because, you know, the amount of data that we use is growing at an incredible pace, and we still need people who will process it and explain to managers in terms of strategy

If we talk about socio-ethical issues, then here we can assume about the emergence of such a specialty as "artificial intelligence ethics specialist" As chatbots are becoming more advanced and may begin to make decisions, the need for artificial intelligence ethics specialists will increase. These specialists will be responsible for ensuring that chatbots work within ethical standards and do not harm users.

- You know, we could use people, I don't know if they would be overqualified lawyers or maybe psychologists, but they would have to work on the ethical side of what's going on... that is I would say there, to resolve issues when the chatbot said something inappropriate or because of his texts happened something irreparable or controversial ... that is, there should be some people who regulate all this

Perhaps in the future there will be a profession of Prompt Manager or Prompt Engineer - who will correctly pose questions for neural networks in order to achieve the most effective result.

- Machines need to be fed with the correct request, because you need to understand that it's still not a person and they can't think for you and understand what you want, so you need to learn how to write the right queries.

Chatbots are already often used in customer service. In this case, it is logical to assume that there will be specialists in working with clients. Their work will be slightly changed from the one that is currently on the market. They will be required to manage and optimize the interaction between users and chatbots. Figure 4.8 shows the division between professions in the labor market

It is worth paying attention not only to some specific professions but also to sort out the skills necessary in the future. Communication with experts helped to

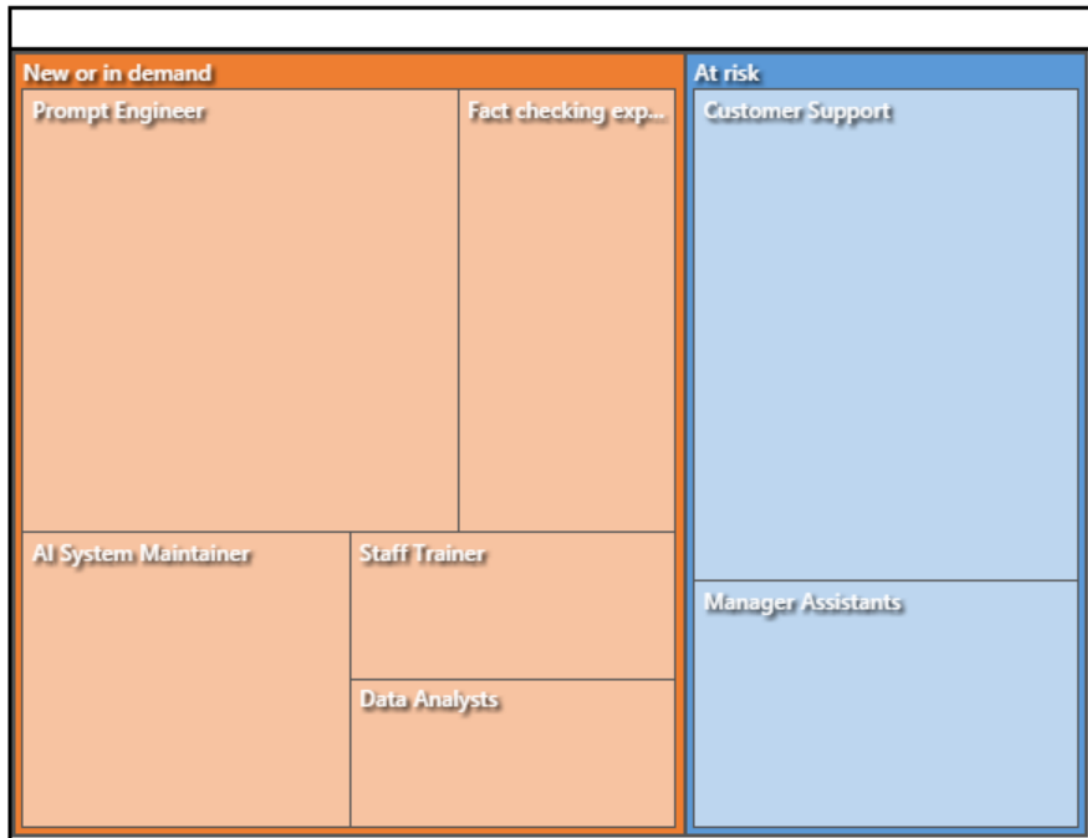


Figure 4.8: Professions graph (Built with Nvivo)

build assumptions about what new skills might be useful in the labor market. With the spread of AI chatbots in the labor market, new opportunities are emerging for professionals who specialize in the development, training and management of chatbots. Some of the key qualifications and skills that will be in demand in the labor market in this area include knowledge of programming languages: specialists working with AI chatbots must be owners of programming languages such as Python, JavaScript, C++, and others. They should have good knowledge in the field of artificial intelligence, machine learning, and neural networks.

Experience in the development and training of chatbots will also be in demand on the market. The sooner people start learning this skill, the easier it will be for them to adapt to the conditions of a changing market. AI specialists should have experience in developing and training chatbots. This may include using chatbot development platforms such as Dialogflow, Botpress, and others. Also, as mentioned earlier, analytical skills may well come in handy. To successfully develop and manage AI chatbots, it is necessary to have analytical skills to study

user behavior and provide optimal solutions. The number of skills in demand also includes Communication skills. Specialists working with AI chatbots should be good communicators in order to communicate effectively with the user and provide them with the necessary information. Society should also develop project management skills: AI specialists should be able to manage projects related to the development and implementation of AI chatbots.

The author believes that these qualifications and skills will be in high demand in the labor market due to the spread of AI chatbots in various industries (fig. 4.9).

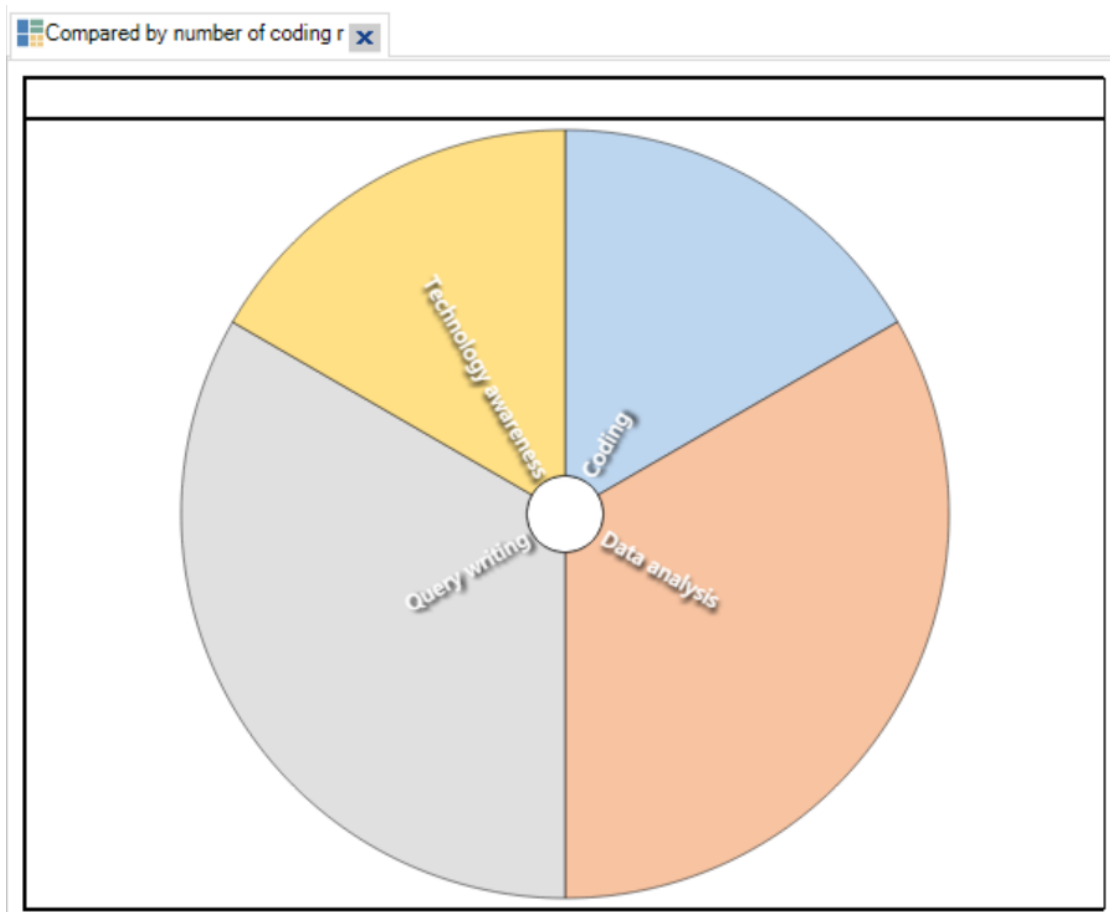


Figure 4.9: Skills in demand (Built with Nvivo)

What is the future of chatbots in Italy? Will they be used, will they be considered useful, and how soon?

With the widespread use of smartphones and social networks, chatbots have become an effective way for companies to interact with their customers and provide round-the-clock support. However, it is still difficult to judge the broad development of AI chatbots in Italy. So far, we are seeing fears and some distrust among a larger number of society. Of course, there are more companies in the northern part of Italy that are interested and not afraid of the latest developments. While closer to the south we can observe a more conservative society. Undoubtedly AI chatbots will find their application in the Italian market, but it is unlikely that it will be in the same volumes as in more northern countries.

- what I know about Italy, is that it's a very traditional kind of country and a very conservative one. So we are almost at the opposite of the United States in a sense, that the United States goes always for new stuff and innovation, even reckless sometimes.

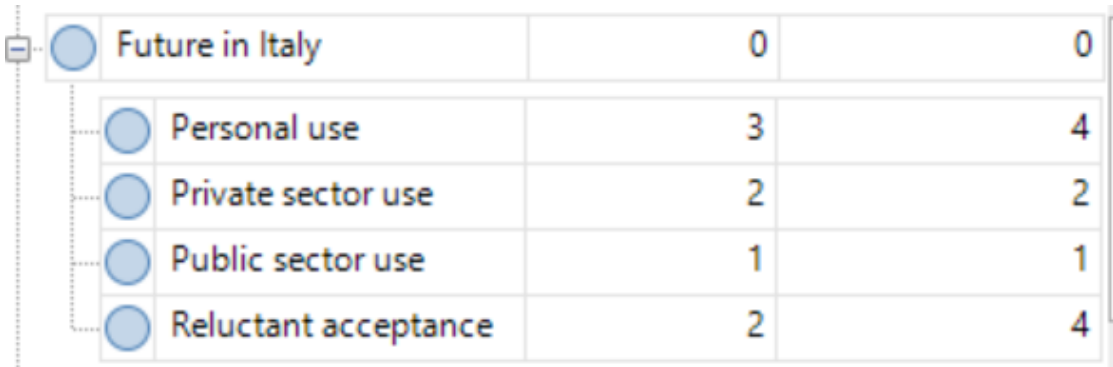
Now ordinary chatbots in Italy are used in various sectors, including finance, healthcare, retail and customer service. They are used to perform tasks such as customer support, booking appointments and providing personalized recommendations. It is expected that the usefulness of chatbots in Italy will increase as they become more advanced in their capabilities.

Chatbots are already integrating with artificial intelligence and natural language processing, which allows them to understand human speech and react accordingly. As the technology continues to evolve, chatbots will become even more intelligent and capable of solving complex tasks.

- But we tend to apply new technologies when they are secure and reliable and also when they don't become a threat for society in a sense. And for society, I mean workers, because we have very strong unions here in Italy that usually are against change, right?

It is difficult to predict how soon chatbots will become a staple product in Italy, but it is obvious that the technology is rapidly developing and being implemented by businesses. As more and more companies integrate chatbots into their activities and it becomes more convenient for customers to use them, the use of chatbots is likely to become more common (fig. 4.10).

- you can't stop the innovation. At some point it will be, it will happen, but it will be slower than we think, I guess. And yeah, at some point it will become a technology like anything else.



Future in Italy	0	0
Personal use	3	4
Private sector use	2	2
Public sector use	1	1
Reluctant acceptance	2	4

Figure 4.10: Future in Italy (Built with Nvivo)

- I think in Italy will be used at some point, but it will be very, it will be a very uphill kind of journey, very slow, very diluted. What I see is more that the single worker will use them spontaneously and autonomously. But for companies to, let's say, implement them as substitute for workers, it will be a hard, hard time for them because they will have to go through a huge fight by unions and by, yeah, associations of workers that are afraid of being replaced.

4.3 Implication of findings and research questions coverage

In this part of the paper, the author answers the research questions posed and examines the hypotheses that were stated in the Introduction of this work.

RQ1: What is society's attitude to the increasing popularity of chatbots?

Based on the results of communication with experts, the author can conclude that society's attitude to the growing popularity of chatbots is ambiguous and may change depending on various factors, such as cultural upbringing, individual experience and personal preferences. There are people who appreciate the convenience and efficiency of chatbots. For example, they were many of the experts themselves, with whom the author communicated. Chatbots can provide fast and automated responses to queries, saving time and effort. However, there is also a group of people who view the growing popularity of chatbots with skepticism and uncertainty. They often question the accuracy and reliability of the answers provided by chatbots. The author's hypothesis was partially confirmed by the fact that some people are afraid of chatbots. Some people are concerned that the growing use of chatbots in customer service and other industries could lead to the elimination of jobs for

people. This problem is especially relevant for people working in roles that can be easily automated. In general, we can say that society's attitude to the growing popularity of chatbots is a mixture of approval, skepticism and concern. As chatbot technology continues to evolve and becomes more integrated into various aspects of our lives, constant discussions and considerations about its impact on society are needed.

RQ2: Can people lose their jobs due to the growing popularity of AI chatbots?

As already discussed in Findings, the growing popularity of chatbots with artificial intelligence can really affect certain work roles and industries. Chatbots with artificial intelligence are particularly effective when performing routine and repetitive tasks that include standard queries, data entry, or basic customer support. For example, we can include customer service and technical support to this. Chatbots can effectively answer simple and frequently asked questions, which reduces the need for a large number of customer support representatives.

RQ3: What new positions can appear on the market due to the introduction of chatbots?

Experts have suggested the appearance of the following positions, which may appear in the next few years:

- AI System Maintainer
- Artificial intelligence ethics specialist
- Prompt Engineer
- Fact-checking expert
- Data Analyst
- Staff Trainer

Most of them help to establish communication between a person and chatbots, teach people how to set effective queries, and how to configure the interface in such a way that the user is comfortable working.

RQ4: What is the expected trend of chatbots development in the Italian market?

As it turned out, Italy has its own way of development and interaction with AI chatbots. Therefore, it may not coincide with the development trends in other countries. Society in Italy is for the most part quite conservative and prefers to make sure of the reliability of the technology before switching to mass use. At the same time, it is observed that in the north of Italy, businesses and companies are more open to new technologies and some companies are already using AI chatbots to perform routine and small tasks. While in the south of Italy, technology is developing at a less rapid pace.

However, thoughts were also expressed on the use of AI chatbots in the field of tourism and the adaptation of tourists to the culture of Italy. This country has a very strong tourism sector of the economy and the use of chatbots in this area is quite prudent.

In this paper, the author also tested the following hypotheses. Here are the results obtained.

HP1: Society is afraid to use AI chatbots because it does not trust the technology.

As it turned out, this hypothesis is only partially justified. Since the fear or enthusiasm towards AI chatbots is expressed to a greater extent by third-party and background factors, such as the upbringing environment, the field of work, the cultural aspect and education. It also became clear that society is quite polarized in the issue of its attitude to chatbots. One part of society treats them easier and wants to try, sometimes even thoughtlessly, while the other is overly afraid.

HP2: Many employees whose duties include performing monotonous work will lose their jobs due to the growing popularity of AI chatbots.

The current hypothesis has been confirmed. Most experts answered that monotonous work is at the greatest risk. Works that can be written as instructions are easily and faster performed by machines.

HP3: Italy, as well as other countries, plans to actively use AI chatbot technology in business.

This hypothesis was also not confirmed. As it turned out, Italy has its own way of development, which was also discussed above. In general, there is a huge potential for using chatbots in the tourism sector in Italy, but much depends on the attitude of society and the authorities to this issue.

Chapter 5

Conclusion

In this paper, a study was done on the impact of the rapidly growing AI chatbot technology on the job market. The author has tried to gather the most comprehensive information that is currently available. By contacting experts in the field of innovation and technology, we obtained information that is currently available on the market. Interviews were conducted in which the author tried to ask all the questions in order to cover the topic from all sides.

Thus, based on the results of the interviews and having analyzed all the transcripts, we can draw some of the following conclusions:

It is expected that in the near future, the impact of AI chatbots on business and the labor market will continue to grow. More and more companies will introduce chatbots to automate and optimize customer service, as well as to improve internal communications and processes. More and more advanced chatbots capable of processing natural language and understanding user requests more accurately will be created.

In addition, AI chatbots may begin to replace people in some areas where complex decisions are not required, for example, in the field of customer service or technical support. This may lead to job cuts in some areas and the need for retraining of employees. In general, AI chatbots will continue to change business and the labor market, and companies that can adapt to these changes will have a competitive advantage.

These are just a few examples of the types of jobs that can be created as a result of the growing use of chatbots with artificial intelligence. As the technology continues to evolve, it is likely that new jobs will appear:

- AI System Maintainer
- Artificial intelligence ethics specialist
- Fact-checking expert

- Data Analyst
- Prompt Engineer
- Staff Trainer

Analyzing the above-mentioned consequences of the introduction of AI technologies on the labor market, including negative ones, the author has developed several recommendations to mitigate possible negative consequences.

For example, companies should engage in retraining and training. Companies and governments can invest in retraining and training of employees so that they can use AI chatbots in their work. This will allow them to keep their jobs and become more competitive in the labor market.

Creation of new jobs. The development of AI chatbots can lead to the emergence of new jobs in industries that are associated with their development, installation and technical support.

Government regulation. Governments can develop and implement regulatory measures that establish rules for the use of AI chatbots in the labor market. This may include restrictions on the use of AI chatbots to perform certain tasks, mandatory retraining of employees, and restrictions on the number of AI chatbots that can replace employees.

Employee participation. Employees should be involved in the process of implementing AI chatbots and be able to express their opinions and offer ideas to improve efficiency and reduce negative consequences.

Gradual implementation. Companies can gradually introduce AI chatbots into production processes in order to minimize possible negative consequences and enable employees to adapt to new working conditions.

Ensuring security. Companies must ensure data security and the protection of personal information collected by AI chatbots in order to prevent possible data leaks and privacy violations.

In general, the author believes that the development and implementation of artificial intelligence technologies, such as chatbots, can have an impact on certain industries and work roles. For example, the use of chatbots in customer service may lead to a reduction in the number of required customer support representatives. On the other hand, the development and implementation of artificial intelligence technologies can also create new jobs in areas such as data analysis, artificial intelligence development and machine learning. The degree of influence of ChatGPT or any other artificial intelligence technology on the traditional way of working depends on various factors, such as the industry, the specific use case and the level of implementation and integration of the technology.

5.1 Limitations of the study

In this work, however, there are limitations. Due to time and resource constraints, the study was conducted only in Italy, which may affect the final study. Also, only 15 experts were interviewed. The author considered this number optimal in the context of the novelty of each respondent's information. However, the author also hopes to conduct more research involving a larger population, using research methods such as surveys.

The author hopes that in the future this technology will be more widespread. Further research also requires attempts to use this technology to test the consequences in practice. However, the author can already assume that it is necessary to conduct surveys among ordinary users and employees who are at risk in addition to this work. This way we will be able to get a full overview of the impact of AI chatbots on the labor market.

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