



How Generative AI will change work in IT in the near future

Polina Malinina

Haaga-Helia University of Applied Sciences

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Abstract

Author Polina Malinina
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<p>This research-type thesis aims to explore the Generative AI technology and its application to the workflow of an IT specialist, the possibilities of integration of Generative AI tools to the business processes, define the scenarios of the technology development and influence on the IT field for the next five years.</p> <p>The research is conducted using qualitative methods. By comparing information collected through systematic literature review and semi-structured interviews with IT specialists, thesis aims to realistically evaluate Generative AI potential and define risks associated with the technology that cannot be overlooked.</p> <p>The report begins with an introduction chapter that defines research aims and objectives as well as the key concepts explored in the study. The introduction is followed by literature review that outlines possibilities and limitations of Generative AI, ways of its application to the IT specialist workflow, impact of the technology on the employee productivity, opportunities and risks related to integration of Generative AI tools into the business processes. The next chapter defines and justifies the interview method, outlines the research focus group and implementation steps. It is followed by the summary of the interview participant's insights and experiences. In the discussion chapter gathered information is efficiently analyzed to answer the research questions. The report is closed by a list of Generative AI tools and their application to various IT roles, recommendations for individual specialists and businesses regarding Generative AI, as well as formulated scenarios of this technology future development and influence on the field of IT.</p> <p>The study concludes that Generative AI is the technology that will stay and become a new norm in the IT specialist workflow. Currently ChatGPT and GitHub Copilot are the tools that will be the most beneficial for the IT specialist, while other role-specific tools may be not yet developed enough to be useful for senior specialists. Generative AI is expected to transform standard IT roles, automate, and simplify development processes. Albeit its benefits for individual specialists, this technology is not recommended to be integrated on the business level for now, since there is no sufficient law regulation of AI, which makes the tools not safe in terms of potential confidential information leakage, issues related to copyright and output bias of the current Generative AI models. The research also formulates negative, neutral, and positive Generative AI involvement scenarios that cover changes that the technology may cause on the IT industry in the next five years.</p>
Key words Generative AI, artificial intelligence, machine learning, natural language processing, information technology

Table of contents

1	Introduction	1
1.1	Overlay Matrix	2
1.2	Key Terms.....	3
1.3	List of Abbreviations	4
2	Literature Review	5
2.1	Introduction to Generative Artificial Intelligence	5
2.1.1	Current Generative AI limitations	8
2.1.2	Future of Generative AI.....	9
2.2	Generative AI IT Application.....	10
2.2.1	IT Roles and Generative AI Tools	10
2.2.2	Generative AI impact on employee productivity	13
2.3	Generative AI use regulations	14
2.4	Generative AI effect on the job market	15
3	Research Method	18
3.1	Justification of Research Method.....	18
3.2	Interview Implementation.....	18
4	Interview Results	20
4.1	The use of Generative AI tools for the work-related tasks.....	20
4.2	The integration of Generative AI tools to the working environment.....	22
4.3	The view on the Generative AI future development	23
4.4	The influence of Generative AI on the IT field.....	24
5	Discussion.....	28
5.1	Debating the effectiveness of Generative AI Individual use	28
5.2	Pros and Cons of Generative AI business implementation	31
5.3	Forming predictions on Generative AI future evolvement	34
5.4	Drawing Conclusions.....	36
5.4.1	For Individuals	36
5.4.2	For Business.....	37
5.4.3	Generative AI development and influence scenarios.....	38
	Sources	41
	Appendices	45
	Appendix 1. IT Roles and Generative AI tools that can be applied to it, version 1.....	45
	Appendix 2. Interview Questions Framework.....	47
	Appendix 3. Testing ChatGPT code-writing functionality	48
	Appendix 4. IT Roles and Generative AI tools that can be applied to it, version 2.....	51

1 Introduction

In the highly competitive work environment, such as Information Technology field, it is important for specialists to constantly expand their knowledge. But with new iterations of technology releasing every year, there is a possibility that new skills may become irrelevant in the long term. From the entrepreneur side it is necessary to be confident in technology to invest in its implementation. In 2023 one of the most talked-about topics is Generative AI and its capabilities for work and business. Being relatively new, the technology rapidly developing, numerous tools released over the course of the year. Artificial Intelligence tools are starting to become our everyday assistants. It is undeniable that this technology will affect the industry but is it worth studying and investing in right now? Moreover, a worrying prediction arises that suggests that AI may replace humans in the number of jobs. In my research-based thesis I will show how Generative AI tools may be integrated into the IT specialists' workflow, try to predict how AI will affect IT-related jobs in 1–5 years, which of them AI will change or potentially replace, and what skills will become relevant soon. The research goal is to prove that Generative AI is a promising technology that can boost IT specialist performance and formulate how it can be smoothly incorporated into business processes to gain benefits from the changes.

The research's main question can be defined as: How to prepare for the changes that Generative AI will bring soon as an IT specialist?

Along with this, thesis aims to answer:

- What are the possible scenarios of Generative AI development in 5 years?
- How Generative AI can be applied to different IT roles?
- How Generative AI tools can be integrated in the IT business processes?
- How Generative AI will influence jobs in different IT fields?

Results of the research will be strongly beneficial for people working in the IT field. It will help to understand the set of skills needed to work with AI, how to prepare for the change, and what career paths are better to perceive. Being aware of the changes and preparing for them will make the skills-shifting process faster and easier. Additionally, various Generative AI tools will be presented, with the opinions of specialists that already had experience of working with this technology, so it can be possible to find suitable tools for different IT roles. The research findings will also be useful to business representatives as they will reveal the risks and benefits of introducing Generative AI into business processes.

The report consists of a Literature Review, Research Method, Interview Results, and Discussion chapters. To establish a solid knowledge base for the study and outline the main ideas, a

systematic literature review performed as the first step of the research. For the review academic sources and web sources are used to gather necessary information. Recently published sources are prioritized since Generative AI field is developing rapidly. In addition to the literature sources, OpenAI ChatGPT functionality is presented to explain how Generative AI tools work. As a second step, semi-structured interviews with IT specialists are conducted to study their practice of using Generative Artificial Intelligence tools, considerations about the future of technology and personal ideas. Information presented in literature review part of the study is used to support or oppose the points reflected in the interview results to formulate the definitive answers on the research questions. In the Discussion chapter the analysis is performed using information from the systematic literature review and interviews to list general recommendations regarding Generative AI for individual specialists and businesses, scenarios of the Generative AI future development formulated for the next 5 years. Research conclusions are finally presented in subchapter 5.4, Drawing Conclusions.

1.1 Overlay Matrix

Use Table 1 to navigate to investigative questions materials in the report. The questions are listed on the left, they represent the research objectives. Accordingly, the chapters that cover research themes are listed on the right.

Table 1. Overlay Matrix

Investigative questions	Literature Review (chapter)	Interview Results (chapter)	Interview Questions
What are the possible scenarios of Generative AI development in 5 years?	2.1	4.3	9-11
How Generative AI can be applied to different IT roles?	2.2	4.1	3-6
How Generative AI tools can be integrated in the IT business processes?	2.3	4.2	7-8
How Generative AI will influence jobs in different IT fields?	2.4	4.4	12-14

1.2 Key Terms

A list of key terms and concepts used in the report.

Artificial Intelligence is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. (Copeland 2023)

Natural Language Processing is a branch of Artificial Intelligence that focuses on the interaction between computers and humans through natural language. NLP involves enabling machines to understand, interpret, and produce human language in a way that is both valuable and meaningful. (Crabtree 2023) **NL models** are AI models that can interpret and generate natural language.

Generative AI, in the context of this research, refers to Artificial Intelligence models that can generate some form of content, such as text, code or images in response to a prompt, commonly based on NL models.

Prompt, in the context of this research, is an input for AI model. It can be in text, audio, or image form.

Prompt Engineering is a technique used in Artificial Intelligence to optimize language models for desired outputs. It refers to the process of designing prompts for AI models to enhance their performance on specific tasks. (Mascellino 2023) In this report the technique will be referred to as **prompting** and the ability to design the prompts referred as **prompting skill**.

Information Technology is the common term for the entire spectrum of technologies for information processing, including software, hardware, communications technologies, and related services. (Gartner Glossary 2023) **IT field** refers to Information Technology as a business sector.

IT jobs in this research is an umbrella term for variety of jobs that involve programming, design, data management, cybersecurity and other activities that imply use of Information Technology. Individuals working in the IT field are referred to as **IT specialists** and sets of activities that are generally involved in a specific IT job are referred to as an **IT role**. IT roles that are covered in the scope of this research include: Web Development, Software Development, Database Development, AI Development, Low-code Development, No-code Development, Data Engineering, Application Testing, Web Design (UI/UX Design), Hardware Engineering.

1.3 List of Abbreviations

A list of common abbreviations that are used in the report, Table 2.

Table 2. Abbreviations List

AI	Artificial Intelligence
IT	Information Technology
ML	Machine Learning
DL	Deep Learning
RLNF	Reinforcement Learning from Human Feedback
NLP	Natural Language Processing
GPU	Graphics Processing Unit
UI/UX	User Interface/User Experience
UBI	Unconditional Basic Income
SaaS	Software as a Service
CRM	Customer Relationship Management

2 Literature Review

Artificial Intelligence is a field of computer science that is concentrated on building systems that can imitate human intellect. Machines powered by AI can learn, create, and solve problems. The idea of a program that can imitate humans appeared long before the technology itself, as we can see with many modern technologies now, it all started with science fiction. Famous Isaac Asimov introduced rules for robots that prevented machines from harming humanity in short story "Runaround" (1942), rooted in history as "Three Laws of Robotics".

The idea that humans can create human-level intellectual systems started philosophical debates that continue to this day. In 1950 Alan Turing introduced his famous test in "Computing Machinery and Intelligence" paper: evaluator should communicate with two subjects through text messages, one of them being a human-imitating machine, and by comparing the two define who is the real human. The purpose of the test would be to define whether machines can think or not. Today we have systems that can complete the task – ML models, type of AI systems that can be trained to act like humans.

One of the current Internet sensations, ChatGPT and other GPT series models developed by OpenAI, was thoughtfully tested, Turing's test included. In last year's research, "The Turing Deception" GPT-2 was used for this test. The results showed that whether the machine can pass the test or not depends on specific circumstances, while some people may find the machine writing, others not. More recent attempts were destined to fail – GPT-3 and 4 openly inform the user that they, in fact, talk to a machine. This fact completely fails the test conditions since evaluators must not know the identities of the subjects. While passing the Turing test seems a matter of time, the purpose of the test will not be fulfilled, since current ML models cannot think for themselves, it only imitates human speech. Even if the newer ChatGPT versions will pass the test, humanity is safe, for now. (Noever & Ciolino 2022; Somoye 2023)

Apart from fiction and philosophy, AI now serves as a multi-functional tool that can be used in almost any work field. Even if the model does not think, but only resembles a human, it can produce a product that holds value. This chapter will concentrate on generative AI tools and prove that they can be used to automate, simplify, and improve quality of IT related jobs.

2.1 Introduction to Generative Artificial Intelligence

Generative AI tools took over the world in 2023. It is hard to find someone who has not tried to chat with one of the generative models. This field of AI developed rapidly in recent years, presenting opportunities of generating new content like text, images and more, by training on existing sets of

data with DL models. The user first needs to input a prompt, text-based instruction, and the algorithm will interpret it using Natural Language Processing. With NLP it becomes possible to communicate with AI in the language we use with other humans. In recent months, many tools appeared, with the most well-known being ChatGPT, Bing AI, DALL-E and Midjourney. The popularity of these exact tools may be explained by the vast databases they are based on and non-specific ways of application as they can be useful in everyday life. While the research will further concentrate on tools that can be applied to an IT field, starting with the introduction of well-known examples will create a basic understanding of how most Generative AI model function. (Alto 2023; Vinsel 2023)

But how exactly does AI train and improve over time? OpenAI uses RLNF to teach their language models based on feedback from the users.

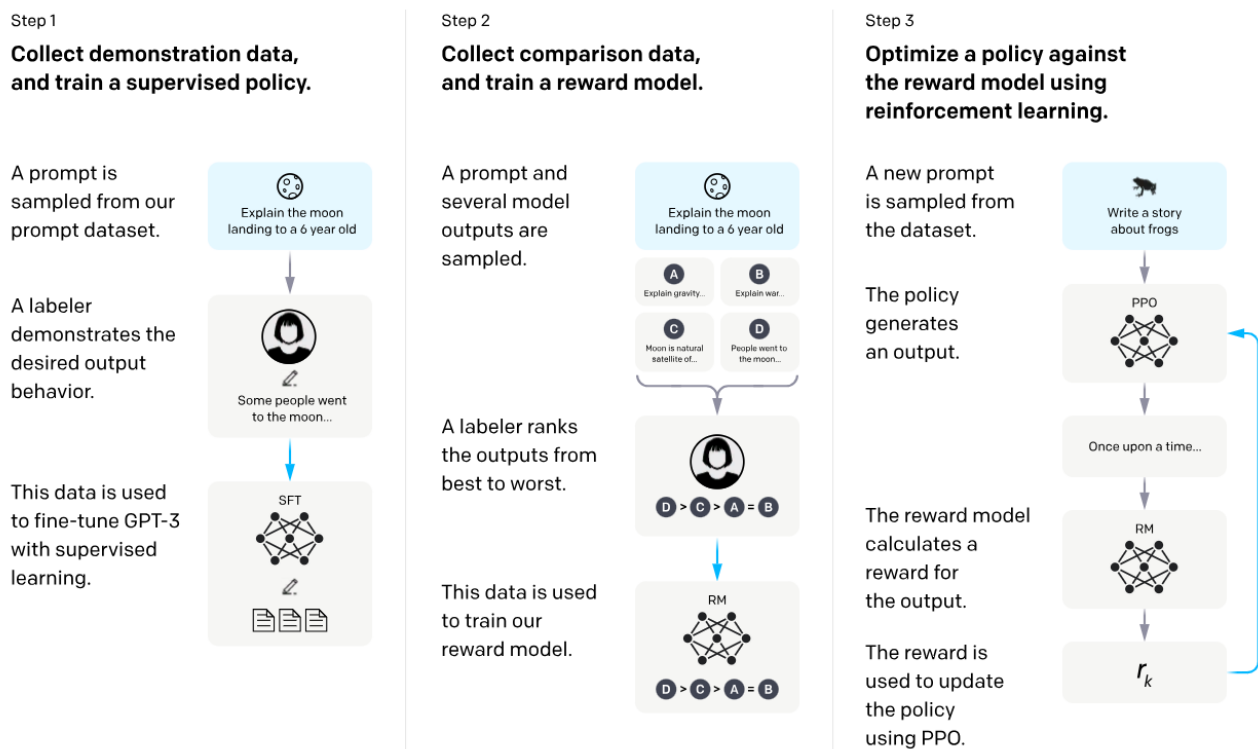


Figure 1. How GPT models are trained (OpenAI 2022)

As presented in Figure 1, the learning process consists of three steps. The first two include labeler – a person that acts as a teacher for the model. In the first step the labeler proves an output example for the GPT model to present what kind of response is desired for the specific prompt. The labeler's next task is to evaluate the sample outputs for the reward model. Variants that ranked higher receive higher reward stat and vice versa. Then policy and reward models start to interact between each other, where reward model act as an evaluator and policy act as a human that gives

output based on a prompt. The highest evaluated answers are saved to the policy model, so the next time it receives a prompt like earlier ones, the answer will be the most suitable. Later AI users themselves become labelers in this dynamic, evaluating outputs and communicating with the policy model. RLNF forces the model to constantly reevaluate itself, sort out better outputs and expand its database, which makes AI a tool that learns and improves the more it is used.

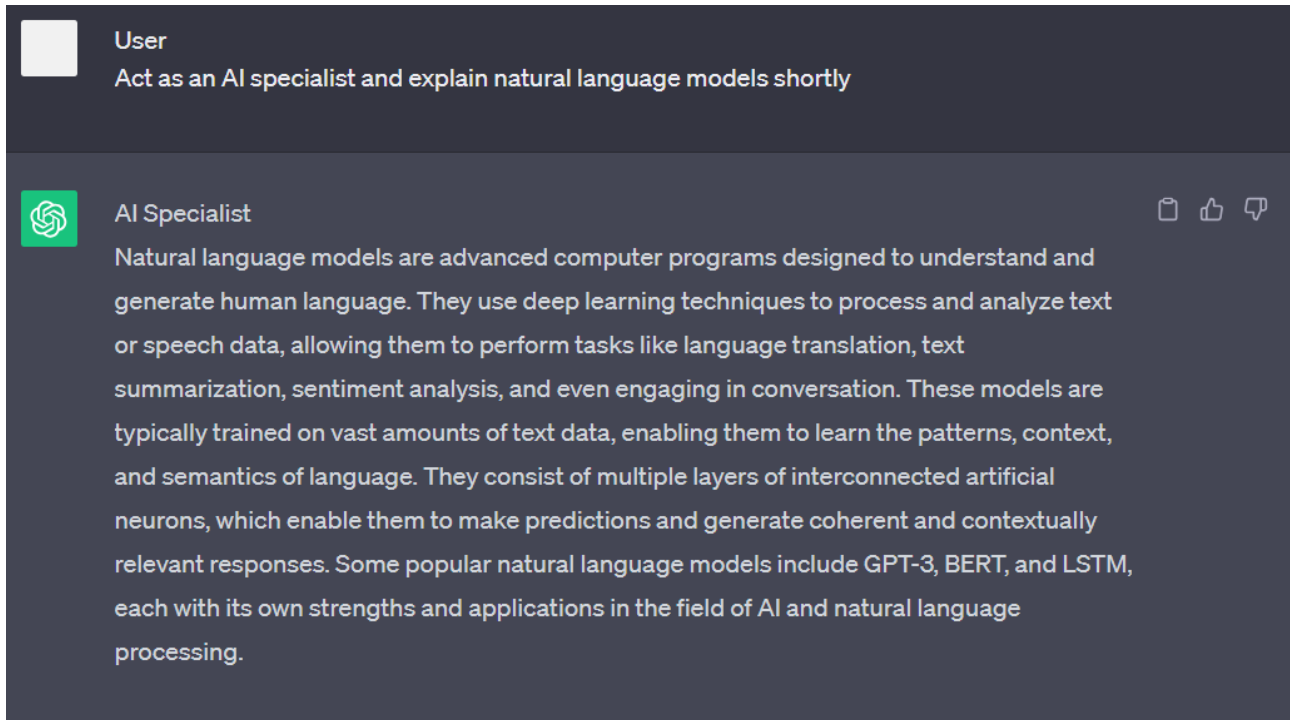


Figure 2. Example of GPT-3.5 model output (OpenAI 2023)

Figure 2 presents an example of ChatGPT use. The top section is a prompt, instructions from the user, and beneath it the output from the model. On the right-side evaluation buttons can be seen so the result can be labelled good or bad. The prompt is written using a common pattern where a model is requested to act as someone, an AI specialist in our case. This is one of the ways to make the model be specific with the answer since it scopes down the search to knowledge from the artificial intelligence field only. The output correctly fulfills the prompt request – the NL model concept defined with use of specific terms and overall text is short. Other chatbots function like this example.

In this segment it was briefly explained how Generative AI models work, how to use them and proven that they are constantly improving with use. As mentioned earlier, AI possibilities do not stop generating text, it can produce images, music, video and even code, that we will expand into further. But beforehand it is important to define limitations of Natural Language and other models that must be considered to work with AI as a full-fledged tool.

2.1.1 Current Generative AI limitations

Technology is not perfect. To efficiently use a tool, it is crucial to understand its limits and challenges that it may bring. In this segment limitations of Generative AI that are common for the current models will be defined, not diving into model-specific characteristics. Additionally, IT-field related examples that are relevant for the research will be introduced.

Quality of Output

Aminollahi (2023) states that the Generative AI tool output quality heavily depends on the quality of training data and amount of it. If the model does not excessively train on the specific theme, the content it produces may be far from desired. Moreover, the data that the model is based on may be outdated. If the tool is used for study, research or any other fact-based practice, the results must be rechecked to ensure correctness. It is suggested to check the relevance of the databases whilst working with Generative AI. This limitation may present a great challenge while working with code-generating. Coding languages update often and often a particular version is needed for the application. If the model is not introduced to the relevant updates, it will not produce correct output.

Output Bias

It is extremely difficult to ensure that the output produced by AI is not biased. What the model considers truth depends heavily on the training data. This limitation may be dealt with while working with local Generative AI models, where the organization takes control of the information that the model has access to, and it is possible to control the bias of the output. But when working with Generative AI tools where users have no knowledge of the database or control over the training of the model, the results must be taken with suspicion.

Restricted Creativity

Aminollahi (2023) follows that it can certainly be said that Generative AI can produce new content, hence be creative, but the scope of what it can generate is limited by what samples are already in the database. The model cannot produce new concepts or ideas that have not been previously presented to it. It can be easily explained with the image-generating AI models. When asked to produce a painting, the model composes a piece following technique of art pieces that it trained on. While the image produced is something new, it still follows style defined by artist or artists, depending on the instructions. On the other hand, this limitation may not be as relevant in some cases. For example, the task is to develop a mobile app design. To fasten the development process, an AI tool is instructed to generate base design with specific requirements, which will be enhanced by the designer team further. In this case the content is generated to be a starting point, resembling

other designs, or to serve as an inspiration. Another case may be a task related to software development. Good code is a code that is simple and effective, not unique. The end goal is to present a fast and proper working solution, and code-generating or code-autocompleting AI will be of a huge help.

Training Scope

It is possible to develop a Generative AI solution for an organization, but this limitation must be considered before starting the project. Before the tool becomes effective, it must undergo training, which requires a massive amount of sample data and a testing team that will act as labelers for the reward model. Unlike standard software solutions that can be used to the full potential right after being completed, the AI algorithm improves with time and use. The project plan for the Generative AI development should scope the training period, until the model becomes useful.

After we got through limitations it is possible to see how strongly data affects the workflow where AI tools are used. Even a great algorithm fails without correct information and training. To apply a Generative AI as a primary source of content a user must ensure relevance of databases, double-check model output for biases, mistakes, or misinformation.

2.1.2 Future of Generative AI

Facing limitations of current AI systems and market fever over the technology many questions arise. Will investment in Generative AI be profitable? What future the technology hold? One of the aims of the research is to present several future scenarios that will try to answer these questions. Before that we need to define how the technology race started and which companies will be relevant for the tool's evolution in the long term. This information will serve as a basis for the research predictions.

In 2019 Microsoft invested \$1 billion in OpenAI, as they announced their partnership in AI development. This became a steppingstone to the development of many AI tools, with the most notable release being ChatGPT in November of 2022. It was not the first chatbot introduced to the public, but it was different. OpenAI's chatbot presented opportunities of Generative AI to millions of people, based on the GPT-3.5 model, it shaken the industry with the advancement of NLP. From the release the public became highly interested in generative tools and paid high attention to the AI-related projects of other companies. To join the technology race Google presented their version of ChatGPT – Bard, and recently Meta announced that they are planning to release a powerful ChatGPT open-source alternative next year. With industry titans' competition comes rapid development of technology, it is also clear that the Generative AI field will expand on the market with the access of capable open-source alternatives. (Microsoft News Center 2019; Wheatley 2023)

One of the products of partnership between Microsoft and OpenAI is GitHub Copilot. based on GPT-3 model, this is a coding assistant that makes code suggestions and feedback. This tool is one of the focuses of this research, supplying opportunities to speed up the process of writing code and improve code quality.

Important mention is the huge role of Cloud services in Artificial Intelligence race. Amazon Web Services, Google Cloud Platform and Microsoft Azure collectively spend more than \$100 billion per year for Generative AI hardware, Nvidia GPUs specifically. Big players in the field strive to include powerful AI functionality in their feature list. Moreover, this project cannot be executed without suitable hardware and Nvidia currently supplies one of the best products on the market for this purpose. (Bornstein, Appenzeller & Casado 2023)

Big companies are investing in Generative AI, which indicates an increased interest in evolution and the potential that these tools have for optimizing business processes. The purchase of hardware for AI by Cloud services suggests that this technology will remain with us for a long time and, eventually, will become the norm. The deployment of Generative AI project requires investments in infrastructure, specialists, and maintenance and there is no point in investing in such a large-scale project without an optimistic view of the technology and its future. Additionally, new powerful generative tools can be expected to be released, as well as improved versions of already existing ones, since we are able to witness a powerful alliances of technology giants like OpenAI and Microsoft that resulted in appearance of Copilot, DALL-E, ChatGPT and more, with other players jumping into technology race to release their alternative models. Goldman Sachs Research estimates a \$150 billion total addressable market for Generative AI – 22% of the global software industry (Cohan 2023) Which paints an optimistic picture for the development of the technology and marks it as an important aspect to consider while formulating possible scenarios of IT field future.

2.2 Generative AI IT Application

In chapter 2.1 we covered definition of the Generative AI tools, in this chapter ways how these tools can be applied to various IT roles will be presented with the examples, as well as results of various studies reflecting on how Generative AI affect IT specialists' performance.

2.2.1 IT Roles and Generative AI Tools

Code-generating AI is a tool for computer programmers that is aimed to fasten the developing process, reduce time on error-solving and improve performance. As programmer's role often includes excessive writing of similar code segments, that is partially solved by reusing code, AI can take that job for the programmer and produce code in response to the specific prompt. To use these tools only prompting skill is required, since the algorithm will generate output based on the

instructions that have to be clear to achieve the best results. Moreover, programming processes are often interrupted by bugs. In a complex application the process of defining the root of the problem may take a huge amount of time, which is to be resolved by coding assistants. The model analyses code based on understanding of the given programming language, best language practices and common writing patterns, makes suggestions and marks errors. Assistance not only reduces code errors, but presents a quality solution, which increases overall application performance and improves programmers' knowledge of the language. Code-generating tools are useful for IT roles such as web developer (frontend, backend), software developer, data engineer, hardware developer, application tester and other roles that center around code-writing.

Already mentioned in subchapter 2.1.2, GitHub Copilot is a cloud-based subscription tool available as an extension for development environments that provides code autocompletion, code writing from the prompt and code suggestion functionality. Copilot provides subscription plans both for individuals and businesses. (GitHub 2023) This tool is currently considered the best on the market, but there are many alternatives, including ones that are free of charge. Tabnine is a good variant that is free for individuals, but restricts the functionality to short code completions, providing full functionality set with paid plan. There are more specific tools such as Bugasura that analyses the code on the bugs and makes suggestions on how to solve the problem, CodeWP that specializes in writing Wordpress websites and AI Helper Bot for SQL queries. (Morris 2023) ChatGPT is the most affordable alternative, with GPT-3.5 model provided for free it can generate code segments on the most popular coding languages, but, of course, this tool is not specified for code writing and its performance is worse than other tools mentioned. Additionally, it can help programmers to write software documentation. Writing documentation is an essential part of the developing process, but it may take a huge amount of time. With chatbot's help the process can become much faster – model analyzes the code and generates summary of its functions.

Applied to data engineering, Generative AI can solve role-specific issues. Merced (2023) introduced examples of how ChatGPT can be integrated into the data engineer workflow. The tool not only writes SQL queries and Python code but translates code from one SQL dialect to another which may optimize the platform migration process, generates data pipeline boilerplates, or database documentation. It can also be used as an informative tool, providing short and clear instructions on the programming language or architecture. Generative AI can definitely optimize the process of working with data, it is a matter of time then more specific tools will appear for this role.

When it comes to application testing Generative AI can aid not only in writing the test cases, but in defining what tests are needed for the application based on the code and make test code suggestions, analyze testing results. These tasks can be handled with the code-generating tools

mentioned before, but also with the testing-specific tools. For example, a test-automation system Testigma provides an NLP-based tool for test case writing. Additionally, Generative AI can generate test data for the application.

Generative AI tools also can become an assistant for a web designer. For example, UI designer can use it to produce mockups in response to the prompt with color palette, design pattern and other guidelines, understanding even complex ideas such as emotional charge. These designs may serve as an inspiration or a basis for the final design. For a UX designer the tool may visually present the interface ideas, which can speed up the process of making decisions regarding the functionality.

One of the well-established systems that utilizes Generative AI for web design purposes is Uizard. The Uizard Autodesigner tool can not only generate design from the text prompt, but also populate design with AI-generated images, placeholder text, and interactive components. The well-known interface design tool Figma can also integrate AI with plugins. Recently Builder.io introduced Visual Copilot. This Figma plugin allows users to generate Figma designs from the prompt, it is also possible to generate section by section and choose out of number of layouts. The plugin also converts the design to a React, Vue, Svelte, Angular, Qwik, Solid, or HTML code. Currently only beta version of Visual Copilot is available, but it is free of charge for this period. Moreover, designers can benefit from non-specific tools such as ChatGPT and image-generator tool DALL-E, with chatbot generating placeholder text for the mock-up and generation of the images suitable for the design. (Sewell 2023; Uizard 2023)

Adobe Firefly is a Generative AI tool for creating images, text effects and color palettes. It provides free plan with restricted number of generations per month and paid plan with a larger number of generations plus additional features. What makes Firefly different from other image-generators is that all images that were used to train the model are from Adobe Stock, openly licensed and public domain content. It makes images produced by the tool safe for commercial use and does not violate artist copyrights. Firefly content credited with a tag that informs viewer that it was generated by an AI tool, aiming for Generative AI transparency, accountability, and responsibility. (Adobe 2023)

With the rise of low-code/no-code development platforms, the opportunities opened for people not efficient in IT technology to design and develop applications. The development process is handled like constructor building – stacking a set of provided blocks to form an interface, applying settings to change the style and features, automate workflow. However, Generative AI enables customizing and automating low-code and no-code development to the next level. Nanda (2023) listed products that already utilize Generative AI to optimize the development process. The low-code platform Retool provides built-in AI functionality, “Retool AI” chatbot can be assigned to a variety of actions,

including generation of text, images, populating return forms, writing support tickets. Moreover, everything produced by the tool is automatically based on user's application information, resulting in relevant, personalized outputs. It is possible to evaluate Retool AI performance built-in OpenAI support, connecting to OpenAI API with user's own API keys. "Ask AI" can generate JavaScript, SQL or GraphQL queries from the prompt instructions, edit existing queries, explain the queries or adding commentaries, fix errors. No-code tool Bubble allows to build SaaS platforms, marketplaces, and CRMs. Recently they announced their aim to build GitHub Copilot for no-code. They see users describing their applications in a prompt and Bubble producing minimum viable product as a starting point, updating it based on the following prompts. Overall, there are many opportunities for Generative AI to be integrated into the low-code/no-code development process and more tools will appear soon. (Haas 2023; Retool 2023)

Table with the IT Roles and Generative AI tools that can be applied to it, version 1, can be found in Appendix 1. The table will be updated with more tools and the methods these tools can be applied to the roles according to the information collected on the interviews.

2.2.2 Generative AI impact on employee productivity

Despite Generative AI tools started to be incorporated in a work process not long ago, various studies were already conducted, trying to determine how Generative AI tools will affect the workflow of an IT specialist or already showcasing the results of the tool use.

Dohmke, Iansiti & Richards (2023) studied use of GitHub Copilot by 934,533 users. The research finds out that use of the tool sizably affected developers' productivity. With users accepting 30 % of Copilot code suggestions on average, they report increased productivity due to these suggestions. They estimate that Generative AI developer productivity benefits could boost global GDP by over \$1.5 trillion USD by 2030 by helping to meet growing demand for software, declaring a massive impact the technology is taking on the industry.

Another study points out Generative AI's opportunity to simplify the process of UX modernization. In the research report the UX modernization process identified as challenging and time consuming, since it requires a lot of manual steps by multiple team members. But the study presents an example of using Generative AI to make the process easier and overall elevate the team's performance. (Houde et al. 2022)

Ebert and Louridas (2023) express their opinions regarding Generative AI tools in software development. This technology can improve software performance in several ways, such as automating repetitive tasks, improving software quality by creating specified tests, and automating production workflows. There is no doubt that Generative AI will accelerate software development. Study by

Hörnemalm (2023) presents software developers experiences after implementing ChatGPT in the work process. The results suggest that ChatGPT makes software developers more efficient at performing tasks related to coding and planning but there are problems with tasks based on communication due to problems with text formatting like text length, tone, and formality. Moreover, ChatGPT allows specialists to easily solve tasks, regardless of their experience level. However, the research has found that those junior developers relied on and trusted ChatGPT more than senior developers, meaning that if the tool produces biased or outdated output there is a risk of it being unknowingly used.

The studies positively indicate the effectiveness of Generative AI tools on the IT development process, providing opportunities to make processes faster and easier. This confirms that these tools can significantly increase employee productivity and are worth implementing into the workflow. But the risks associated with current Generative AI tools must be considered to provide the best ground for technology integration. Information on how specialists use the tools in their work and how their companies regulate the process is provided in Interview Results chapter and further analyzed to determine the effect of Generative AI on employees of different IT fields.

2.3 Generative AI use regulations

As Generative AI integrated into the company's processes, it is important to establish a list of regulations that ensures smooth workflow and secures confidential information.

Albeit AI tools can be productively used in a working environment, the ways model's outputs are incorporated must be controlled, since the data provided by the tool may not reflect the truth. As I already mentioned in subchapter 2.1.1, AI content may be biased if trained to follow specific ideas. Moreover, as all data prompted to the AI tool is stored for the further training of the model it brings possibilities for the unauthorized disclosure of personal or confidential data. The security problem is proven to be a significant, causing ChatGPT to be temporarily banned in Italy. According to BBC News article, the Italian supervisory authority informed of ChatGPT leak of user private conversations and payment information on March 20th. "The authority stated that there is no legal basis to justify 'the mass collection and storage of personal data for the purpose of training the algorithms underlying the operation of the platform'". The ban was taken after OpenAI agreed to inform users that all data that they provide is collected and may not be secured. (McCallum 2023)

The security problem may also be a cause for some companies to ban usage of AI tools by their employees in fear of information leakage. As study by Vinsel (2023) point out that Samsung already suffered from the problem, as it failed to control leak of its intellectual property to ChatGPT by the employees. OpenAI's chatbot was banned from use in Samsung for fear of the issue, which

has not stopped the leaks after the ban was lifted. The company decided to control the situation by limiting employees prompts to 1024 bytes, hoping that it will reduce the damage. They also invested in the development of their own chatbot tool. (DeGeurin 2023) Vinsel states that unrealistic narratives that circle around current AI technologies push companies to incorporate the tools in the workflow, not measuring the risks and limitations they currently have. While the company may now fall behind or largely benefit from the inclusion of Generative AI, he suggests not to rush with the AI-related decisions and implement measurements of the technology.

The regulations for the use of AI in the European Union are yet to be established. The AI Act was proposed by the Commission on 14 April 2021, adopted to negotiating position by the European Parliament on the 14 June 2023. If it becomes a law, the EU AI act will contain a set of rules on use of AI systems and services with the aim to protect its users' rights and personal data. (The AI Act 2023) Before the official regulations take power, it may be advised to operate with Generative AI tools with caution. The companies that decide to allow the usage of AI by employees can address this problem by issuing the rule set for the AI tools. The rules may state to mark the output of the tool so it can be separated from the work done by a human, require to re-check the output of algorithm, state what information cannot be disclosed to the tool.

2.4 Generative AI effect on the job market

With Generative Artificial Intelligence rapid development, it became clear that it can replace humans in tasks that require clear instructions but will be able to achieve more in the future. A reasonable concern arises – Will AI take over our jobs? The worries regarding this idea existed for a while and resurfaced now when the technology started to affect the job market.

One of the well-known examples of this is a Hollywood Writer's Strike dispute. With Writers Guild of America (WGA) fighting for fair wages, they express concern in possibility of using Generative AI to partially replace the writers on their jobs. AI can be trained using existing scripts and can produce a good text already and will become progressively more skilled. While for now It cannot replace a writing team entirely, it was used against the WGA strike terms, reducing the impact of their actions. (Martell 2023)

How can this be applied to the IT-related jobs? As have been stated earlier, ChatGPT can produce not only a movie script, but a working code, and more tools appear each day that can cover other IT development roles. May it be a matter of time AI will become not only an aid but a threat for a specialist? Conflicting opinions on this issue were found in the process of research.

Forbes presented their list of jobs that they believe will be replaced by AI within a decade, including jobs in software servicing and software quality testing. They believe that growth of AI will enable to

fully automate application testing, while code-generating tools will provide an opportunity for business users to self-service their needs. (Forbes Technology Council 2022) Other study suggests that code-generating AI will cover entry-level computer programmer jobs and image-generating tools like DALL-E and Lensa reduce overall demand in graphic designers. (Urwin 2023) It means that UI design field may be affected by AI, since it can generate application layout. Alternatively, UX designers will be able to implement their ideas right away without contacting a UI specialist or frontend developer, replacing it with the Generative AI tools. Since most current web-design job applications include both UI and UX design skills as a requirement, it can be concluded that AI will not replace but transform the web-designer job to be more UX-centered, while UI will be mostly automated by AI. It will not replace the actual programmer or designer but allow us to test the ideas and evaluate do they are worth it to be fully developed. In the terms of Software Development, it may indicate that the changes and improvement to workflow followed by generative tools application will be relevant for high-level computer programmers, transforming their job to be more productive and freer of mundane tasks, but possibly taking job from the minor specialists.

Ebert and Louridas (2023) suggest that the rise of code generation tools and low-code development most likely will cause a decrease of software engineers' salary. Additionally, they expect that over the next three years, most software development companies will have a development and testing strategy with integrated AI. Software developers will need new skills, such as improving automatically generated code, and AI maintenance. Traditional IT roles will definitely change.

Addressing the salary decrease, it was one of the important points of Hollywood WGA strike negotiations. However, the regulations released at the end of the strike are expected to protect writers in this regard. Text generated by AI cannot be used as a basing material for the scripts, meaning that it cannot be used to reduce writer's credits. It will manage the payments because writers receive it based on their contribution to the material. Moreover, writers cannot be forced to use AI and this technology cannot be used to write or rewrite scripts. (Silberling 2023) While salary calculation for the programmers is different, future Generative AI regulations may affect the issue in an alternative way, which will compensate reduced time reserved for the code-writing in the process of software development. The programmer role may become less significant in the upcoming years, but activities related to this role may be replaced by other tasks involving AI.

Thus, AI will not only replace some jobs, but create new ones. The World Economic Forum addresses this opportunity in 2023's Future Jobs Report presenting the changes that will occur in the next 5 years. "Demand for AI and Machine Learning Specialists is expected to grow by 40 %, or 1 million jobs, as the usage of AI and machine learning drives continued industry transformation. Recent research on Generative AI indicates it may affect a significant proportion of total worker tasks.

However, this does not distinguish between tasks being augmented vs automated.” Research also finds that this is most likely to affect higher wage roles and jobs with greater barriers to entry. (World Economic Forum 2023)

Table 3. Generative AI effect on the IT Roles 2023 – 2027.

Roles that might be fully or partially replaced	Roles that will be transformed	Roles that will be created
Entry-level computer programmer	High-level computer programmer	AI and Machine Learning related roles
Application tester	UX designer	
UI designer		

Table 3 represents draft outline on AI job market effect in five years. These findings are up for debate and will be further analyzed in the Discussion chapter, following the Interview Results.

3 Research Method

The chapter explains the choice of the thesis research methods, as well as justifying the choice and providing detailed guide on the implementation.

3.1 Justification of Research Method

To study such an extensive topic as Artificial Intelligence and get reliable results, it is necessary to choose a suitable research method that will allow us to delve into the methods of applying this technology. Qualitative method of conducting research allows to consider people's thoughts or perceptions, point out important details. Therefore, qualitative method is the most suitable for the research theme since it allows to explore the subjective experience of Generative AI tools users, delve into specifics of the tool's benefits and limitations, explore impact of AI on working process of IT specialists. Using qualitative research, thesis aims to uncover the present and future of the Generative AI tools and their technological and societal impact on the industry.

The interview type is established to be semi-structured. The choice of interview method is dictated by the interview focus group since the research goal is to gather opinions of specialists in different IT fields. "The semi-structured interview would be grounded in the empirical data — the lived experience as narrated by the participant — and increasingly engaged with theoretically driven questions and prompts toward generating meaning." (Galletta 2013, 53) It is expected for this qualitative research method to bring the most insights and examples from the interviewees, since it allows a conversation to be flexible yet stick to the questions framework to cover key interview themes.

3.2 Interview Implementation

The focus of this research is to get a comprehensive outline on IT specialists experiences with various Generative AI tools, the reasons why some specialists do not use them, find out how use this technology regulated in the companies they work for as well as get their insights on the future of their field and Generative AI. The questions framework designed specifically for the interviews allows to lead the conversation dynamically, opening the possibility to get nuanced responses from the interview participants.

The interviews conducted online, using Microsoft Teams, Zoom or Discord, depending on respondents' choice. The time of the interview is estimated to be half an hour. The conversations are recorded using the Windows Sound Recorder app. The transcript of the interview was created based on the recording and used in the report.

The interview begins with an introduction to the respondent. Next step is explaining the interview's purpose and objectives, as well as informing them how the collected information will be used. Before starting, consent on recording of the interview is received, as well as agreement on using the recorded content and respondent's job title in the research report.

Part 2 – Questions

First, the respondent explains their professional experience and current job. It allows to adjust the flow of the interview to gather more relevant information. The conversation continues based on the questions framework, omitting some questions if they are not relevant or asking more specific questions if needed.

Interview questions framework can be found in Appendix 2.

Part 3 - Finalization

The interview is finished by thanking the respondent for their time and opinions. After the conversation ended the interview recording is transcribed to be further analyzed and presented in the Interview Results part of the report.

A total of four responders were interviewed for the research. The job titles of interviewees are web developer, UX designer, hardware engineer, AI developer. Participants represent different fields of IT, which makes the research results completer and more nuanced, the collected information shows experiences on the use of AI tools in various IT roles workflow and reflect opinions about the future of Generative AI from different angles of technological knowledge.

4 Interview Results

The interviews with specialists working in different IT fields were conducted to determine their opinions on the Generative AI future, find out how they use Generative AI in the working process and how Generative AI tools use regulated in their workplace. In this chapter the collected information summarized based on the research objectives, going through the responder's insights on the themes and defining the tendencies among them.

4.1 The use of Generative AI tools for the work-related tasks

This chapter covers the information regarding practical integration of Generative AI tools in the work process. The interviewees shared the tools that they use and evaluated their experience with the technology.

To begin with, the responder working as a UX designer shared their experience with Generative AI. They use ChatGPT to generate placeholder text for the designs, as well as UI tool called Uizard, that was already mentioned previously, "I provide keywords for my application and the tool generates some ideas on the UI layout for it so the tool can give me some hints or inspiration if I have nothing on my mind." According to the responder's opinion, Uizard is not suitable to be fully integrated in the working process yet, since the functionality is primitive. They explain that the tool is used primarily by young specialists as an inspiration but not as effective for experienced designers. But there is another aspect that may prevent designers from trying the new technology, "I think maybe just me, and another designer use that tool because it is a paid application. Not many people believe in Generative AI tools and do not want to pay this much for that." Despite its flaws, the responder believes that Generative AI web design tools have a bright future, since the tools ask for feedback and constantly improve, it is a matter of time before they become smarter.

Responders working as software developer, AI developer and hardware engineer also shared their opinions on the use of Generative AI to write code, specifically ChatGPT 3.5 and GitHub Copilot. According to their experience, ChatGPT can write a decent code and improves their productivity on the job, but there are some shortcomings that cannot be ignored. "If good code is generated, then it can be used in production, but of course the code needs to be rechecked and it happens that code has the wrong syntax. For example, in C++, it often forgets the ';' at the end of the line," "Sometimes ChatGPT has problems with code logic. For example, when it generates code for microcontrollers, it does not know that two functions are needed for interrupting," the answerers stated. These problems seem to not be prominent while using GitHub Copilot, but the huge difference is that ChatGPT 3.5 version is free of charge, while Copilot is a paid application. Only one participant reported using Copilot, others are not ready to pay even if they receive a higher quality

output from the tool. Overall, the code-generating tools are warmly welcomed by the developers, and they are looking for the technology evolving, they evaluate it as convenient.

The Generative AI tool not mentioned previously was brought up by one of the responders. “When we had tasks related to the frontend, we used an AI that generates the code of an element in the design from the drawings – Sivi AI. Very useful tool. We drew a couple of templates and used it to give us the code. But it is still very primitive. You start the program and upload a photo of the layout and it generates variants of this design and code,” they shared. The tool can use the picture of the design or a drawing to generate a layout and a frontend code for the layout. The result is fully customizable, but the functionality is yet lacking for it to be used in difficult cases.

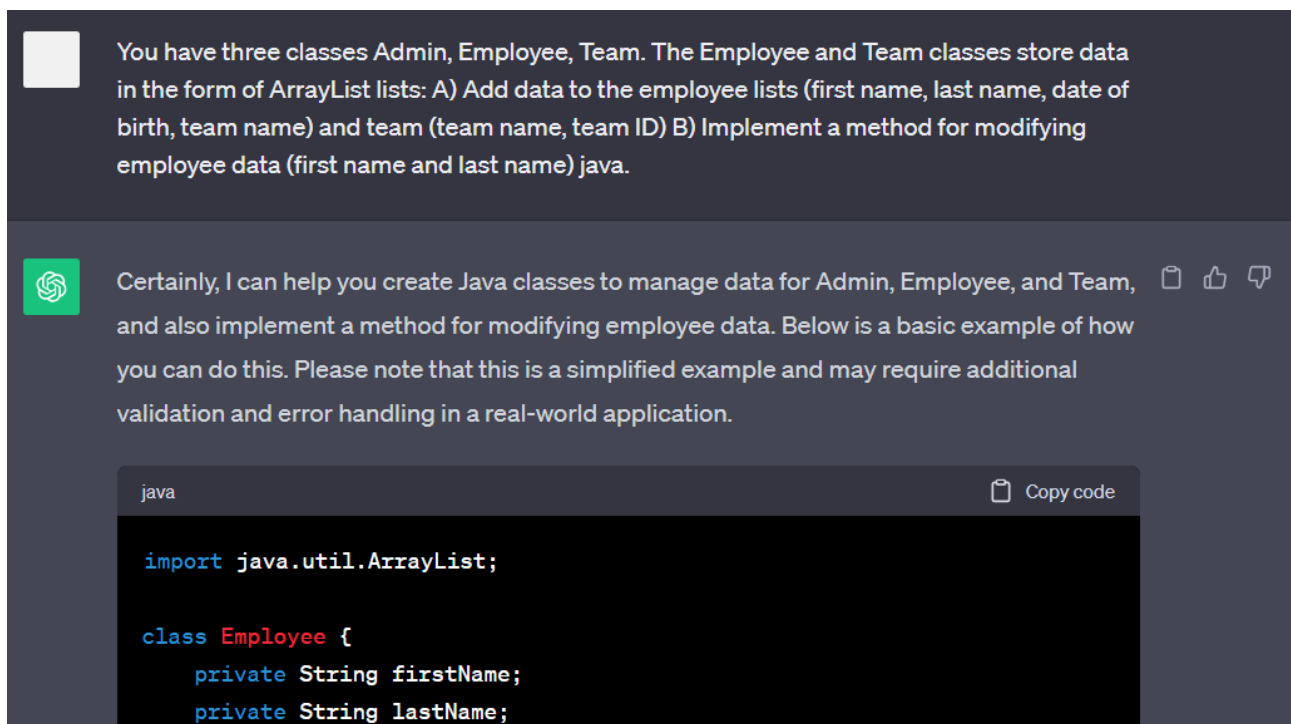


Figure 3. Prompting ChatGPT 3.5 with code-writing task (OpenAI 2023)

The responder also shared an example of prompt that can be used for ChatGPT code generation. I tested the prompt and the code output on the ChatGPT 3.5 model. Figure 3 shows the chatbot terminal, with the request on the top and output on the bottom. It could be positively mentioned that the code is already formatted to be easily read and copied, there are also added commentaries that explain what each part of the code does. I used Visual Studio Code editor to check the syntax and to test the code. At least for this example, there were no syntax mistakes. The code was running without problems, it fulfills the task described in the prompt. The instructions on the test performed, full code and testing result can be found in Appendix 3.

The example is a basic code, which could explain lack of syntax or logic mistakes in the output reported by the responders. Nevertheless, it proves that ChatGPT 3.5 can understand the coding tasks and produce correct basic code that works in a matter of few seconds.

4.2 The integration of Generative AI tools to the working environment

The results in this category have shown a drastic difference in how businesses view Generative AI. As the responders explained their company's relationship with the tools, the reasoning behind the decisions became clearer. There were two common cases that can be noted – some view Generative AI as a threat and completely restricts the tools, others do not regulate the use of AI at all.

The first case was presented by the participant who works for the company that is against AI use. "They are afraid of intellectual property leakage," they explained, "If we let OpenAI write a piece of code, then they will have this piece of code and they will also have the vulnerability that is in this piece of code." According to responder, this reasoning is justified for large companies or companies connected to government, since they or their clients can be potentially targeted. The information prompted to the third-party AI tool stays on the servers of the provider company where the user cannot supervise the privacy of the user data. The responder stated that big companies solve this problem by deploying their own AI tools, but it is certainly not possible for anyone. "Deployment of such an infrastructure and its use is very complicated," they followed, "I think that even large companies that do not specialize in IT will use someone else's services, those they trust." To deploy personal AI tools a company should have a separate IT department that develops and supports the system, as well as specialized servers and AI-specific hardware. Some alternatives exist, such as open-source Generative AI builders, Llama 2, and its modification Code Llama. It is indeed possible to deploy a small-scale tool, like GitHub Copilot, using available resources, like a personal laptop. But the use of such infrastructure, if limited to small companies, will benefit more from using third-party systems anyway. The responder indicated that he recently participated in a small start-up that is similarly restricted AI use, they evaluate such decision as paranoid. "The fact that everyone will use AI is undoubtable because it increases labor productivity well," they concluded. According to the results, companies that are currently against Generative AI will have to find ways for integration regardless, the technology cannot be ignored due to its potential benefits and inevitable market impact.

Alternatively, a couple of responders report total ignorance on the Generative AI topic from their higher-ups. "They do not care about it," participant stated, explaining their company's lack of interest in AI whatsoever. The employees in the company use Generative AI tools as they want, without any restrictions or general rules. A comparable situation was reported by the responder working as a UX designer in an IT consultant company. They stated, "With ChatGPT we use it to generate

content for our designs, and I think my company does not want us to provide to ChatGPT some confidential company info.” According to the statement, employees care about the company’s privacy by default, not being given specific instructions. But the same behavior cannot be expected from everyone. Lack of clear guidance on the subject leave employees with a dilemma, what data is safe to disclose, what tools can be trusted, will unsupervised use of Generative AI tools lead to problems later? Another approach was taken by the managers of one of the respondents working as a software developer, who encourages the use of AI and often in the development process. Nevertheless, there are still no official guidelines for Generative AI use released in their company.

4.3 The view on the Generative AI future development

The results for this theme shed light on the aspects not yet discussed previously. In particular, the hardware aspect of Generative AI, a potential stagnation of the technology evolution due to computing power limitations and otherwise development of it on the new level.

Responder who worked on multiple AI development projects shared their opinions on the future of the technology, “Firstly, it will continue to develop. It will be more complicated, will probably change the architecture. Now there are many variants of transformers on which AI tools are built, they have problems with computing power. So, AI is a pretty expensive toy. Now engineers are trying in every possible way to solve this problem. What AI have under the hood will definitely change.” They followed by explaining the current state of Generative AI, introducing terms from Daniel Kahneman’s “Thinking, Fast and Slow” to describe how model works. According to Kahneman, the human brain operates by two systems, System 1, and System 2, that are used in different life situations. System 1 is fast but solves the problem on a surface-level, mostly presenting the previous solution on the identical problem from the memory. System 2, on the other hand, is relatively slower but is responsible for complex multi-level problems that require time and brain resources to handle. (Kahneman 2011) The responder explained, “In fact, we currently have System 1, that has a much bigger memory capacity than System 1 of a human brain. But it is still System 1, the AI does not have a stream of consciousness and cannot solve strategic tasks that require a multi-way solution.” There are, however, tools that mimic the human thought process. The responder presented AutoGPT as a tool capable of performing this. The tool, given a sequence of prompts, can solve some multi-step problems. For example, if told to break the task into subtasks, each task into more subtasks and then solve each subtask it can resolve a complex problem. But it is still a half-measure since it is not an actual thinking process. They followed: “A full solution will be a generative system, I will abstractly call it, with an ‘inner voice’. Which generates some text for itself, we call it a thought, and some text, well, texts in an abstract sense, it produces outwards to give an answer to a question or solve a certain problem.”

The specialist explained that the development of System 2 is a matter of time, the most positive estimation is the appearance of the technology by the end of the decade. The main problem relies in computing power for the potential System 2 models since they will require drastically more computing power than ones of a previous generation. The pace of Generative AI progression will depend on the development of microelectronics, since its systems rely on computing power for training, setting up experiments and inference, especially for a highly loaded service. "If we look at the years up to 2018, the development of graphics cards followed the path of constant electric power," the specialist followed. The visual cards were growing in productivity but remained at the same energy level, for example 300 Watts per crystal. But currently, along with the performance, the size of the crystal began to grow, which means raise of the energy intensity and the normal numbers become 600-800 Watts per crystal. "This suggests that the development of microelectronics is no longer keeping pace with market demands," they stated. According to calculations, the problem, they refer to as "silicon problem", will become prominent in the span of 5-10 years and will affect the pace of AI development in a negative way. But there is still a chance of a positive development scenario if an alternative technology will appear. "We have two options, either the development of generative systems towards full-fledged artificial intelligence that is similar to human, or we will see the completion of this sigmoid-like technological cycle, and the technology will reach some plateau. But conceptual ideas and prototypes of the next generation of processors that will help to solve the silicon problem already exist," they concluded. The existence of hardware alternative that will manage to match the AI raising energy demands will be the next major step is the development of System 2.

4.4 The influence of Generative AI on the IT field

The results have shown various opinions on the subject, covering different fields of IT. The responders gave their insights on how their job will change in the near future and what part Generative AI will take in it, as well as their personal concerns on the matter.

To begin with, interviewees working in code-writing related jobs addressed the idea of AI tailoring programming tasks for programmers. If the entry-point for coding will significantly lower, what skills will become relevant? "Most likely the work process will simply involve more creative or organizational skills. I think in the future, everyone will forget about writing code, AI will do it," the responder stated. They believe that employers will ask for code-understanding skills, so that programmers can read the code and fix potential errors, but the ability to write it will become less relevant. Simply put, they should understand the logic behind code to create correct prompts for the Generative AI and to realistically evaluate the output.

Contrary to this, other responders raised their concerns on the matter, “If you reduce the standards of language knowledge, then the junior – middle – senior levels for programmers will immediately disappear. This will lead to a horrible result. These levels were invented for a reason. It all comes down to experience and knowledge of the language. Programmers level is defined by how much code they have written in their life.” They suggest that the programming entry-level knowledge must be kept the same, to prevent breaking well-established coding standards. With the current system of evaluating specialist expertise based on the amount of code they have written, the integration of AI in the working process may invalidate the system. The skill shift may define if programmers’ job is about mastering the language itself or the ability to produce best logical solutions for the problem.

Regarding the skills related to Generative AI that may become prominent for a specialist, one of the responders shared the analogy that explains prompting as a process of picking up keys to a keyhole. If the owner comes and changes the lock, there is no other way than to start picking from the beginning. Another example is to compare prompting skill to human interaction. To look at the tool as a person and the ability to work with it as a human. It would take time to learn how to communicate effectively. The responder shared, “I would consider the same for every young specialist to study these tools from the user’s point of view. Keep track of how they develop, what new things appear and how they help solve your problems.” They ensured that it is enough to watch an explanation video and to search the instructions on the internet to understand how to work with the Generative AI tool. According to the responder, it is better to know what tools exist and how they develop, but it is not necessary to study them specifically if they are not needed at the moment, since they can be learned in a small period of time.

Participant working in web design addressed the possibility of AI taking the designers job, as well as creators’ copyright problem. They believe that Generative AI may replace most of the UI designers’ jobs, but it cannot replace UX designer. “Any digital product is a bridge between people and people,” they explained, meaning that web design is a form of human interaction through visuals, which will require human touch to be perfected. As for the skills of using Generative AI, the responder points out the perspective of the technology being widely used among web designers and becoming a standard assistance tool, “If you do not want to be replaced, you need to know how to use it and utilize it in your work.” Besides the current tools output being far from ideal, there is a positive belief that it will train and upgrade to be better soon. On the other hand, image-generating AI poses a risk to designers since it can copy their work and produce similar designs without copyright. The same problem is addressed by digital artists, who did not give their consent on using their artwork for the algorithm training. The responder added that current designer tools can copy existing designs and produce layouts like them, yet nothing regulates this process. The main

reason being that the model output is different from the original, it brings variation and something new to the design or picture, but the influence of existing work is undoubtable and can be harmful for the actual designers or content creators. The problem must be addressed as early as possible to establish the rules that will support human creators against Generative AI.

Continuing the theme of Generative AI replacing humans in their jobs, the matter was discussed with each interview participant, and their opinions were surprisingly similar. “Some jobs will disappear, but more jobs will appear because of AI,” or “Overall, AI will need support and vice versa, more jobs may appear. I believe that there will be no job cuts, but perhaps the salaries of programmers will decrease,” the responders do not question the possibility of AI replacing their jobs, they embraced the idea and are already preparing for the consequences. The overall attitude is positive, they consider that there are a possibility of Generative AI taking over specific tasks, but humans will always be needed, and more jobs related to AI will be created. The tools are not yet developed enough to possess risks to the IT field jobs but it is safe to keep an eye on the technology and its estimated growth. “Work related to AI will be in demand, I will look at what skills are needed to be hired. I think there will be more jobs in general. But this only applies to the IT industry,” the answerer added, meaning that the situation may be different for other work fields, but it is not critical for the field in the focus of the research.

The responder working as an AI developer shared more general thoughts on the matter, defining the situation to be rather complicated. “With current technologies, like GPT-4 or GPT-5 if it comes out, it will not radically change the market. These technologies will just greatly help people. Besides, humans are still needed for the simple reason that the current systems do not have System 2,” they ensured. According to chapter 4.3, System 2 can be developed at the earliest by the end of the decade, it means that in at least five years there should be no major risks for employees regarding Generative AI. Trying to look further into the future, the responder insists that there always will be some kind of job for humans to do, because, in the end of the day, ChatGPT is a computerized system, “It can generate text and pictures, but it cannot put tiles in the bathroom. And the attempt to create these robots that will put tiles in the bathroom instead of humans is doomed to failure to some extent, for the simple reason that we humans are already the best robots for these jobs.” Robots will be needed in some niche cases, like sorting robots, but there are still a lot of jobs that require handwork from where a human will not disappear. Applied to the IT field, this could mean that the work related to the hardware maintenance will always be in demand, since AI runs on specified servers that require maintenance services. An additional point was also introduced, “Humans love other humans. Autopilots can already win car races, but people will not be interested in watching a robot race in Formula 1, but in how Schumacher drives. Just because there is the same meat man sitting inside, who drives a car.” Another presented example is related to

psychology. AI that assists people as psychologists already exists, but many people would prefer to talk to a human psychologist. It supports the opinion mentioned previously that was addressed to the jobs related to web design. But the specialist also mentions that it could be that humans will take over small amount of cases that will cost significantly more than AI-driven ones. For example, a design generated by an AI tool will be a quick and low-cost solution, while purchasing a design from the web designer will be a much more expensive one.

But Generative AI taking over even some of the human roles means less job seats. Not everyone can easily retrain to become an AI specialist, or it may take a long time. The responder suggests that an AI integration process must be handled by the government to minimize possible risks. They made examples with already established technology – autopilot cars. It is possible to start massively releasing autopilot transport on the streets in five years, but if done so, it will result in massive number of drivers losing their jobs. Therefore, the process of autopilot integration will be regulated by the government to not make this happen. The same should be done regarding Generative AI technology, smoothly incorporate it in the working process. Diving into the area of sociology, the problem may be resolved due to Europe's reducing population, "When the population shrinks, it is necessary to increase labor efficiency to maintain the economy at the same level for its growth, and then we introduce AI." They gave an example of the shortage of taxi drivers in Europe. As the population decreases, the deficit will grow, and it will be closed by autopilot transport. Alternatively, the issue can be solved by releasing people from the economy, that it introduced as an Unconditional Basic Income. The concept of UBI is actively studied in Finland and Canada, introduced on the referendum in Switzerland, it can potentially structure a society where machines are doing most of the work. Overall, if handled correctly, AI taking over jobs will not be a problem at all. "If we talk about tomorrow, then everything depends on silicon, how this industry will develop. And if the pace is maintained for at least another five years, the current growth in the output of microelectronics, then I think in this decade we will already see System 2, and System 2 will be radically different from what it is now, more complicated," they concluded.

5 Discussion

In this chapter we will go through the collected information and define similar tendencies or contradictions in the material. Firstly, the Generative AI tools for the IT specialists will be evaluated and the conclusion of are they worthy of being used in the development process will be made. Generative AI prospects for business will be discussed after. Finally, the predictions on Generative AI future development will be made based on the interview responder's opinions and current AI market situation. The formulated research outcomes are presented in chapter 5.3, there are recommendations for individual specialists, businesses, as well as scenarios of Generative AI future influence on the industry.

5.1 Debating the effectiveness of Generative AI Individual use

The research results have shown how Generative AI tools can be practically implemented into the workflow of different IT specialists. Interview responders working in web development, web design, AI development and hardware engineering shared their opinions and insights on AI, following the research questions.

To begin with, the collected information has brought new tools that can be added to the roles and Generative AI tools table, like Sivi AI, Code Llama, AutoGPT. Regarding the tools already known to us, the survey participants assessed their effectiveness in their work. The most frequently used tool turned out to be ChatGPT, the GPT 3.5 free version. This version was used by all the interview participants for different work purposes. This is not surprising, since OpenAI's chatbot is currently one of the most well-known, available, and versatile tools on the market. Specialists used ChatGPT to get information about the architecture of the code, generate placeholder text for designs, generate code and translate it from one programming language to another. The participants pointed to an increase in productivity thanks to this tool, but also noted its disadvantages that need to be borne in mind when using it. While generating code, the ChatGPT may make syntactic or logical errors. This problem may be the result of outdated databases of this version or its insufficient information regarding code architecture. For example, when generating code in C++, the chatbot may forget to put “;” at the end of the lines. But if to correct syntactic errors, the code works properly. Less can be done about logical errors since the resulting code is working but needs to be rewritten to meet the coding standards. When used to receive information, chatbot can give out outdated information and responders shared that they take a small amount of time to double-check the results since they do not fully trust the tool. These problems seem to have been solved in GitHub Copilot, a code-generation and programming assistance tool. The research participant who worked with Copilot expressed his satisfaction with working with this tool. Their programming process accelerated significantly, the tool generated specific and syntactically correct code. They have

not encountered problems like with ChatGPT. The participant's experience corresponds to the results of the GitHub Copilot study mentioned in subchapter 2.2.2, which reports a significant increase in the productivity of developers that used the tool. It may be concluded, that ChatGPT is a good free, available tool, it can be nice to start the acquaintance with Generative AI technology and then understand whether there is a need to use paid tools of a higher level, such as Copilot.

The situation has shown to be different with current web design Generative AI tools. They are not yet sufficiently developed to be useful for experienced designers. An interview participant working with a paid tool for generating designs indicated that so far this tool is suitable for junior designers or as a source of inspiration. Other designers in their company are not yet ready to pay for the functionality that the tool can offer them, but they do not refuse to use Generative AI per se. They expect the tool to evolve and become useful in the future, even so it was suggested that design-generators can replace UI designers completely. But UX design will still be in demand at least until AI learns to think like human, that will not happen the earliest by end of this decade, according to the results in chapter 4.3. Moreover, tools such as chatbots and image generating tools have proven to be useful for the design process. Chatbots can generate placeholder text for designs, which speeds up the process, generated images help make the design unique. But additionally, there is a problem related to the copyright of images produced by AI. The works of artists and designers can be used to train tools without their consent. This raises the question of how ethical it is to use such tools as OpenAI's DALL-E for commercial purposes. To overcome this issue, it may be recommended to use Adobe FireFly. It provides both a free and a paid subscription plan. The tool is trained exclusively on Adobe Stock, openly licensed and public domain content, which makes the generated images safe for commercial use and does not violate the rights of content makers. Nevertheless, it is possible to continue using image-generators like DALL-E but solely for inspiration purposes.

When it comes to the regulations of Generative AI use, according to the research results, many companies have not released official AI instructions for the employees yet. If that is the case, it is highly recommended to inform the company whether the employee is integrating Generative AI tools in their workflow. Prompts and the code generated by the tool remain the provider's servers, as well as potential vulnerabilities of this code or the information that the company does not want to disclose. For security reasons, it is better not to include the information on the company's processes in the prompts, unless permission is received. This can prevent the situations like presented in chapter 2.3 with the Samsung employees that accidentally leaked confidential information to ChatGPT while using it in their work. On the other hand, some companies completely prohibit the use of AI, which makes it impossible to integrate these tools in the workflow. According to the research, this must be a temporary measure. Generative AI significantly increases the

productivity of employees; it is a matter of time before it becomes widely used. Therefore, even if currently it is prohibited to use Generative AI tools, a general familiarity with the technology will help to integrate them easily in the future.

Regarding the effect that code generation tools can have on the programmer's work and whether they can replace him, the opinions of the interview responders differed. One participant expressed their concern about the potential decrease in the level of knowledge of coding languages and architectures by programmers if they begin to actively implement Generative AI in their work starting from the junior position. Moreover, the existence of AI that can write good code may affect the junior-middle-senior programmer evaluation system, since it significantly relies on the programmer's ability to write code and the amount of code they wrote. Of course, these are not the only criteria that are considered when evaluating the level of expertise, but it cannot be denied that the system will have to be changed to satisfy the new reality, in which the code is mostly written by machines. Other interview participants shared that the introduction of AI will not lead to problems but will become the new norm. As code editors are used to help with development, Generative AI tools will become essential for a programmer.

Both study in chapter 2.4 and interview participant in 4.4 expressed their concern in effect that code-generating tools will have on programmer's wages. Indeed, with the change of programmer's role it makes it possible that salaries will decrease, since most of the job will be done by Generative AI. But, in the prospect of this research, it cannot be estimated how harmful this would be for IT specialists since the development process includes various activities apart from programming. Potentially the changes that would happen to the development process due to integration of the new technology or eventual Generative AI regulation will balance out the decrease. On the other hand, it is also possible that failing in Generative AI legislation can cause harmful effect on the wages.

Nevertheless, everyone seems to agree on the opinion expressed in chapter 2.4, stating that AI will create new jobs. Addressing the problem of AI replacing humans, as indicated in chapter 4.4, the one-time introduction of many autopilot cars can lead to collapse as drivers will lose their jobs. But in the case of IT jobs, a programmer working in different areas of development will be able to re-train to work with AI much faster and with less resources than it would take a person who is not familiar with the IT field at all. This does not mean that if a specialist suspects that AI can replace them in the workplace in the future, they need to start retraining for an AI developer right now. But this fact convinces not to panic on the topic. Even if the situation develops according to a negative scenario, IT specialists are in the best position to adapt to the changes. At the same time, based on chapter 4.3, the introduction of Generative AI should not have a critical impact on the industry

for another 5-10 years, and this is subject to the active development of technology. The evolution of AI can be slowed down by the limitations associated with microelectronics, namely computing power, which will be discussed in more detail in 5.3.

Regarding whether the skills required for an IT specialist will change in the next five years, opinions also diverged. There was an opinion indicating that it is possible for the entry level of coding language knowledge for programmers to decrease, and, contrary to that, opinion that AI will not affect the required level at all. But it was agreed that the ability to work with Generative AI tools will be appreciated by employers for any IT role. It should be noted that learning how to use these tools does not take much time and resources, since it requires knowledge of effective prompt structure and interface navigation to start working with it. AI models are constantly changing as well as effective ways of interacting with them, so it is better to keep an eye on the updates of relevant tools and refresh the knowledge sometimes.

The general conclusion of this research is that Generative AI tools are worth familiarizing with and they truly increase the IT specialist's productivity. Chatbots and code-generators are the most effective tools currently, they can take the development process to a new level. More specific tools, such as design-generating tools, may not be sufficiently developed by far, but they promise to evolve into full-fledged assistants soon. There are no specific tools for some areas of IT yet, such as cybersecurity, but the appearance of such products is a matter of time, since the capabilities of AI to automate and simplify processes can be applied to all IT areas. AI models learn and get better over time with their use, it makes sense to keep an eye on technologies that could potentially be useful. Nevertheless, until The AI Act is officially established and there are unresolved problems related to copyright, it is necessary to approach the process of integrating Generative AI in the workflow carefully, inform the company on the whichever tool is used and what information is enclosed to it. It is recommended to choose tools that are safe for commercial use. It is also necessary to keep in mind limitations of the current Generative AI models that are listed in subchapter 2.1.1, and to double-check the information given by the chatbots or other AI information assistants.

The version 2 of IT Roles and Generative AI tools table can be found in Appendix 4. More tools mentioned by interview participants and a list of technologies that are yet in development but are worth looking out included. As well as an addition of a specialist's opinions on the tools that can be helpful to determine whether it will be helpful in the working process.

5.2 Pros and Cons of Generative AI business implementation

One of the main goals of the research is to determine whether it is worth investing in the integration of Generative AI in the business processes, what advantages and risks are associated with the

implementation. The interviews succeeded in presenting how different companies relate to this technology, how the use of AI is regulated and what employees think about it.

One of the decisions reported by the interview responders was the restriction of Generative AI use. This ban is dictated by the possibility of leaking confidential company information to the tools. In chapter 2.3 the Samsung case was mentioned, the company prohibited employees from using ChatGPT, then after the ban was lifted, several information leaks followed. Nevertheless, the company did not extend the ban, but took measures to limit the length of prompts that employees can send to ChatGPT and provide regulations on AI use. Samsung also decided to invest in their own tool, with which the company's confidential information will be safe. The reason for allowing Generative AI use despite the risks is the enormous potential of these tools in increasing employee productivity.

The ability to deploy a company's own Generative AI system can solve the problem of confidential information leakage, but not all businesses can afford this project. According to chapter 4.2, to create and maintain its own Generative AI infrastructure, the company must have a separate IT department dedicated to these tasks and purchase specialized servers and hardware. AI systems consume a huge amount of energy, and the hardware is a huge investment by itself. It is indeed possible to deploy a local Generative AI system even on a laptop thanks to open-source technologies like Code Llama, but this tool will be powerful enough to be used by a small team of employees, the quality of the generated content will also be inferior to larger models. If a company does not trust its information to OpenAI servers, it may be a better decision to wait for the release of similar tools from other companies that will be considered more reliable. For example, based on subchapter 2.1.2, Google, Amazon and Microsoft's largely invested in Generative AI hardware to deploy them in their Cloud services. Considering the size of investments in AI on a global level, a rapid increase in the quantity and quality of the Generative AI tools can be expected.

Another reason for postponing the Generative AI integration into business may be the lack of legal regulation of these tools. The AI Act is currently in a negotiating position, and it is unknown when the law will come into force. There were cases when ChatGPT was banned at the country level, such as the temporary ban of this tool in Italy caused by fear of user personal data leaks. While Generative AI is not regulated at the law-level, it is impossible to be completely sure of the security of the information provided to it. Also, the issue of copyright of images and digital illustrations that are used to train models of image-generating AI has not yet been resolved. This problem is addressed locally by Adobe, the company trains their tool Firefly on publicly available content, which makes the content produced by their product safe for commercial use. But these are exceptions among the rest.

An alternative situation was presented by the interview participants who reported that their companies do not address AI problem at all. Employees use all the tools they are interested in without any regulation. This leaves employees with the dilemma of what information can and cannot be provided to the tools, whether the content generated by AI can be used commercially, whether it is necessary to report whether they use AI tools or not. Since Generative AI is a technology that, according to the results of the study, will not only stay, but will also progress, eventually all companies will have to address the situation related to the use of AI. The sooner it is done the better, as this will build the foundation for the introduction of Generative AI into the company's processes in the future and will help reduce the risks associated with it.

Despite the disadvantages and risks related to the current Generative AI models, they can already significantly improve work efficiency, but their effectiveness will depend on the field in which employees work. For example, the effectiveness of GitHub Copilot and ChatGPT has been proven by extensive research presented in subchapter 2.2.2 and by interview participants who emphasized the usefulness of these tools in code-related work. Therefore code-generating and chatbot assistants' tools are worth implementing into development processes right now. On the contrary, tools related to other areas such as web design, data engineering and cybersecurity may either be absent for now or provide functionality that will be useful only for beginner specialists because of their primitiveness. If the company is interested in tools related to these areas, it makes sense to wait for their further development into better versions that will assist specialists of any level. ChatGPT is a universal tool for any IT field, but it should be used with caution given the possibility of data leaks or getting biased or outdated information as an output.

The general conclusion of this research is that businesses should invest in AI, but perhaps not right now. While there are no official laws related to Generative AI published yet and the security of companies' confidential data remains questionable. Therefore, it might be better to wait and prepare the ground for the introduction of these tools later. Despite that, the company must address the Generative AI whether it is planning to implement it or not. The set of rules for Generative AI use should be released to cover employees who already use these tools by themselves to reduce the risks associated with information security and copyright. The less preferred solution is to prohibit the use of AI in the company. However, if the company decides to implement tools right now, it is recommended to focus first on code generation tools and chatbots, since they have already proven their effectiveness and can significantly increase the productivity of employees working in IT.

5.3 Forming predictions on Generative AI future evolvement

Using the information gathered through literature review and interviews, several scenarios for the development of Generative AI in the next 5 years can be formulated. The analysis will help determine the impact of Generative AI tools on the IT industry, the potential risks, and benefits that it can bring and identify the factors that will determine the development of this technology.

The first factor that is worth mentioning is the speed of the Generative AI development cycle and what can slow down the evolution of this technology. According to the expert opinion presented in 4.3, the main problem is that the microcontroller market does not keep up with the pace of AI development, which will potentially surface soon. The performance of AI models increases, as well as its demand for computing power, raising to the amounts that current hardware technology may not be ready to satisfy. Along with the increase in energy consumption of the video cards, the size of the crystals also increases, which makes the manufacturing process more complicated. Based on the trends in the development of microcontrollers, this complication can cause a slowdown in the development of AI, since it will be impossible to provide suitable hardware to otherwise advancing models. As the interview participant suggests, the cycle of Generative AI technical development will reach a plateau in this case, and it will be maintained until a possible alternative hardware technology is developed. If this scenario proceeds, the Generative AI tools will freeze at a certain functionality level, that will definitely not be enough to replace humans on the job. But still, it is right to expect an increase in employee productivity and other positive effects of the introduction of this technology, but without a significant impact on the market. This development scenario can be considered a neutral one since its implementation will not hugely affect the IT industry and does not involve comprehensive legislation apart from the general changes suggested in chapter 2.3.

The situation differs drastically if alternative hardware technology will be presented before an AI energy crisis occurs. In that case two opposite scenarios should be considered. The first one is negative, in which AI regulation processes will not keep up with the pace of the technology development. Another variant is the optimistic one, in which technology will continue to actively develop and be effectively integrated into business processes.

A negative development version will be caused by Generative AI regulation failure, which will lead to the realization of risks associated with copyright, leakage of confidential information and other ethical problems of AI. But fortunately, it cannot be said that Generative AI tools will cause a job loss in the IT field in such a brief period. According to the opinion of the responder in 4.3, Generative AI will not be able to have a critical impact on the industry at least until the end of the decade. Rather, the scenario will cause a strong distinction between companies that integrated AI effectively and showed a significant increase in employee productivity and companies that do not keep

up with technological progress. Moreover, failure of Generative AI legislation or regulation on the workspace may cause public outrages like the Hollywood Writers' Strike presented in 2.4, since employees will have to demand a proper resolution of list of issues related to Generative AI, as well as react on potential salaries reduction. From the business point of view, the situation may present a dilemma in which the use of AI will mean an improvement in business performance but put at risk the confidential information of the company and its employees or violate any other ethical standards, when the ban of AI use will mean being behind the competitors. Thus, Generative AI tools will have to be integrated into business processes to keep up in the technological race despite the disadvantages.

A positive scenario would mean a strategic success of Generative AI integration in the business processes and the establishment of clear and effective laws related to these tools and the risks they may pose. It will allow companies to confidently use AI models from third-party developers, relying on the information security standards that enforce confidentiality and measures covering AI ethical issues. Moreover, development of this scenario will result in fulfillment of positive predictions regarding technological progress related to Generative AI tools presented in subchapter 2.1.2, since the technology evolution pace and the benefits that the tools will bring will be significantly higher than in the case of a neutral scenario. Potential advantages include speeding up and simplifying development processes stages, improving the overall code quality, reducing code vulnerability, automating tasks that have been performed manually previously. Also, as the interview participants shared in 4.4, many new jobs will be created related to the development and maintenance of Generative AI.

Also, another effect of Generative AI that can be deduced based on the research results is a potential significant raise of low-code/no-code development. While the development process from the user point of view does not require code manipulation for a no-code or minimum manipulation for low-code, working with prepared blocks to form an application, programmers are still required to write these blocks of code first. With advanced Generative AI technology, it will be possible to outward generate code for the application blocks on the go, without the participation of a programmer. It will be possible to create and manipulate the product elements at the user's request, the process is handled with text or image prompts. A similar process has already been presented in subchapter 2.2.1, Bubble, a no-code SaaS building platform, is expected to include this functionality in the future, with the company behind the tool announcing their goal to build Visual Copilot for no-code. Nevertheless, Generative AI is expected to bring the capabilities and functionality of low-code and no-code platforms to new levels.

As many IT roles include code writing in the working process to some extent, it could be confidently stated that programming is one of the fundamental skills for an employee in this industry. Moreover, assessment of the expertise level of the skill is based on the quantity and quality of the code that was been written by a specialist. However, with Generative AI tools that can write high-quality, it may create a trend of shifting the focus from the code-writing for the other tasks in the development process. This trend will be prominent in all AI evolution scenarios presented in this chapter, except to varying degrees. Currently the development process for a programmer generally includes long hours of writing the code, correcting code errors, finding the most elegant and effective solution, adapting new code architectures. The inclusion of Generative AI in these processes will cause a decrease in the time spent in the code-related tasks as proven by the studies in subchapter 2.2.2 as well as by the interview responders' experiences in chapter 4.1. It can be stated that over time, the core of the programmer role will shift to solving problems around the code, but not on writing it.

It is important to clarify that the scenarios presented in this chapter relate only to the introduction of Generative AI tools specifically in the IT sphere. In the global development process of AI in different work areas realization of completely different scenarios can be expected. Perhaps some areas will actively develop and benefit from AI, while others will suffer the negative consequences of the integration process. Moreover, there are AI variations not covered in the research, such as models for robot operation, autopilot, algorithms for image or text analysis that can also affect IT industry in the long run. These technologies are out of scope of this study, but they need to be kept in mind to create an overall picture of future events. Another point worth mentioning is that the presented scenarios evaluate the Generative AI impact on the industry for approximately 1-5 years, no further than the end of the decade. These tools are expected make lasting impact on the market and there will be significant changes in the workflow of IT specialists that can be speculated further, but transformations of this scale are likely to begin when it will be possible to develop and support a Generative AI System 2 that was introduced in chapter 4.3. Up to this point, AI will likely be only a human assistant and global changes, such as AI replacement of humans on their jobs, are yet to be expected.

5.4 Drawing Conclusions

The research conclusions are formulated for individual specialists and businesses, with addition of the Generative AI development scenarios in a short format.

5.4.1 For Individuals

General recommendations regarding Generative AI tools for individual specialists:

- Currently the most effective Generative AI tools are code-generating tools. OpenAI ChatGPT 3.5 model is free, but the code produced by the tool may contain syntactic or logical errors, the code architecture may be outdated. GitHub Copilot is a paid tool, but the quality of the code is higher and tool effectiveness in the development process has already been proven.
- Other Generative tools that are specific for an IT role, like UI/UX design, data engineering, cybersecurity, may have primitive functionality for now and be useful only for beginner specialists. It depends on the tool, nevertheless, it is recommended to try them out and keep an eye on their development since they will likely become much more advanced soon.
- Each Generative AI model is different and different approaches are needed to use them effectively, but the use methods can be quickly learned since these tools are rather easy to use and master. The best strategy is to regularly check updates of the tools to be on time with the best prompting practices.
- Generative AI is not yet regulated on the law level. Therefore, it is advised to be careful with the use of the tools. If the company has not released official instructions regarding AI use by employees, it is recommended to inform the company if the tools are used by employees, what information is provided to the tool and how the outputs are used in the work process. Currently Generative AI can have issues regarding confidential information leaks, copyright and other, if the safety of the tool cannot be proved, do not include any sensitive data in the prompts and do not use generated content for commercial purposes. However, there are exceptions that can be trusted and safely used. If the company trusts the tools and allows unrestricted use these precautions are not applied in that case.
- If the company bans the use of AI, it is still advised to try the tools for yourself and keep track of their future development. According to the research, businesses are likely to integrate Generative AI in their processes soon because of its potential, so this ban is a temporary measure.

Table with various Generative AI tools, their functionality and specialist's opinions can be found in Appendix 4.

5.4.2 For Business

The research main conclusions regarding Generative AI tools business implementation:

- Generative AI can increase employee productivity, these tools have a huge potential for improvement and will become full-fledged assistants for IT specialists in every field. Currently chatbots like ChatGPT and code-generating tools like GitHub Copilot are the most beneficial for the IT specialists.

- The base for safe Generative AI integration is not yet prepared for business, with the tools not yet regulated by law. It means that all information provided to the tools stays on their servers and use of this information cannot be controlled. Moreover, some tools use copyrighted content for the model training, meaning that they are not safe for commercial use.
- There are cases where employees accidentally provided confidential company data to ChatGPT. To reduce risks associated with data leakage it is recommended to assign AI use instructions for the employees or prohibit use of Generative AI. However, AI ban should be a temporary measure, likely the tools will be used in the future since they will be properly legislated eventually, and it will be easier to integrate them if employees have some knowledge of how to operate Generative AI.
- Deployment of company's own Generative AI tool can solve data issue, but the realization of such project is possible mostly for large companies. It requires at least a separate IT department for the tool development and maintenance, specialized servers, and hardware. It is advised to wait for the release of the tools from developers who can be trusted and use their services instead.
- The research prediction is that Generative AI will become a new norm for IT specialists and will be widely used for various purposes. This technology will stay and continue to evolve.

5.4.3 Generative AI development and influence scenarios

There are scenarios of Generative AI development for the IT industry for the next 5 years. The scenarios are ranked based on the impact they would bring on the market. Thus, negative scenario would mean the worst effect on the industry and realization of risks related to Generative AI, neutral scenario means little to no impact on the market and positive scenario means realization of Generative AI benefits.

Features that are common for all development scenarios:

- Integration of Generative AI tools in the working process of IT specialists will happen eventually in each scenario, just in different time. The technology will stay and become a new norm for IT specialists' workflow.
- Raise on low-code/no-code development will continue, with Generative AI tools allowing to further automate the processes and generate applications on the go, pushing the platforms functionality on the next levels.
- A possible trend of shifting the focus from code-writing to the other tasks in the development process, which will lead to transformation of the programmer role. Generative AI will be able to generate high quality code that will have to be adjusted for use in the actual

product, find errors in the code and produce documentation that will cut the time spent on those tasks significantly.

- New jobs will be created related to the development and maintenance of Generative AI.

Negative Scenario

- Occurs if the alternative technology for AI hardware will be developed, the computing crisis will be prevented, and the tools will actively evolve but the industry will fail to keep up with the development on the regulation level.
- Companies will be forced to adapt Generative AI to their processes to keep up with the technological race, but integration of the tools without solid base preparation can lead to realization of risks related to information leaks, copyright, and ethical issues.
- It is not expected that Generative AI tools will cause a job loss in the IT field in such a brief period, but lack of Generative AI regulation can lead to a public outrage demanding a proper resolution of the issues related to copyright, cybersecurity and wages decrease.
- It is possible that some companies will successfully adapt the technology having enough resources for the project, which can lead to disbalance in the business' performance, with some companies boosting their employee's productivity while others failing to do so.
- Businesses will still benefit from the integration of the technology, but it is up to debate if it will be worth it based on the negative effects it can cause for the companies or employees.

Neutral Scenario

- Occurs if microelectronics market will not be able to keep up with the AI's computing power requirements. The technology development cycle will reach a plateau and the tools functionality will freeze to a certain level for the time before a hardware alternative is found.
- Generative AI tools will stay as they are currently but will work better since they would have more time to train by that time. More tools for specific IT roles will be released.
- Generative AI will not hugely affect the market, nevertheless, after the technology is legislated and safe for business integration, IT specialists will benefit from the usage of these tools. But the effect will be much smaller compared to the positive scenario.

Positive Scenario

- Occurs if the alternative technology for AI hardware will be developed, the computing crisis will be prevented, and the tools will actively evolve and successfully legislated.
- Companies will actively integrate Generative AI tools to the workflow of IT specialists, significantly boosting their performance.

- Potential advantages include speeding up and simplifying development processes stages, improving the overall code quality, reducing code vulnerability, automating tasks that have been performed manually previously.
- The changes for the IT industry that AI will bring will create new jobs and opportunities for specialists.

Insights regarding distant future possibilities are presented in chapter 4.3.

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Appendices

Appendix 1. IT Roles and Generative AI tools that can be applied to it, version 1.

IT Role	Generative AI Tool Example	Functions
Web Development, Software Development, Database Development etc.	ChatGPT and/or other chatbots based on NLP model	Generation of code in different languages based on the prompt (basic). Quick generation of applications documentation
	GitHub Copilot, TabNine and/or other code-generating tools	Generation of code in different languages based on the prompt (advanced). Code writing suggestions, bug fixing, code style improvement, code refactoring
Data Engineering	ChatGPT	SQL/Python code generation(basic), database documentation generation, translation of code from one language/dialect to another, data pipeline boilerplate generation
	GitHub Copilot	SQL/Python code generation(advanced), code writing suggestions, bug fixing, code style improvement, code refactoring
Web Design (UI, UX)	ChatGPT and/or other chatbots based on NLP model	Placeholder text generation
	Uizard Autodesigner and/or other design-generating tools	Mockup generation from the text prompt
	Visual Copilot, Figma Generative AI plugin by Builder.io	Generate Figma designs from the text prompt, convert design to a code
	DALL-E, and/or other image-generating tools	Generation of images for the specific design

	Adobe Firefly	Generation of images, text affects and color palettes, safe for commercial use
Application Testing	ChatGPT and/or other chatbots based on NLP model	Generation of the test cases in different languages based on the text prompt (basic). Generating of the test data
	Testsigma test-generation tool and/or other test-generation tools	Generation of the test cases in different languages based on the text prompt (advanced)
Low-code development	Retool AI tools (Retool AI, Ask AI)	Generation of text, images, populating return forms, writing support tickets. Generation of JavaScript, SQL or GraphQL queries from the prompt instructions, edit existing queries, queries explanation, comments addition, errors fixing. Built-in OpenAI support

Appendix 2. Interview Questions Framework

- 1) Are you familiar with the concept of Generative Artificial Intelligence?
- 2) Do you use Generative AI in your daily life? For example, ChatGPT.
- 3) Do you use Generative AI on your job?
- 4) If so, how exactly? Give examples.
- 5) Does Generative AI improve your productivity at work?
- 6) If not, what is the reason? Do you plan to use them in the future?
- 7) How is the work with Artificial Intelligence regulated in your company?
- 8) How much have Generative AI tools changed the work in your industry? Is the influence positive or negative?
- 9) Do you think this technology has a future?
- 10) Do you worry about the rapid development of Artificial Intelligence?
- 11) Do you think Artificial Intelligence can replace a person at work?
- 12) Does Generative Artificial Intelligence create risks for companies and employees in your field?
- 13) What is the direction in which your job field is developing where you can see AI take a certain role?
- 14) What skills will become key for an IT specialist in your field in the next 5 years?
- 15) Do you have any more comments or ideas on the topic? Can you recommend me some sources of information that can be beneficial for the research?

Question 1 is followed by a brief explanation of Generative AI technology if the respondent is not familiar with it. Questions 4 and 5 are used if the respondent gave a positive answer on question 3, question 6 asked if answer on question 3 is negative. Various questions may be added on demand.

Appendix 3. Testing ChatGPT code-writing functionality

Assets used for the test implementation:

- OpenAI ChatGPT 3.5 model
- Microsoft Visual Studio Code code editor
- Visual Studio Coding Pack for Java extensions bundle
- Java Development Kit 17 (JDK)

The test was performed with the following set of actions:

- ChatGPT was prompted with the instructions.
- ChatGPT produced code as an output.
- In Visual Studio Code environment, an empty Maven java project was created.
- The code was copied to the Main.js file in the created project.
- The code has been run and produced a console output.

The prompt: “You have three classes Admin, Employee, Team. The Employee and Team classes store data in the form of ArrayList lists: A) Add data to the employee lists (first name, last name, date of birth, team name) and team (team name, team ID) B) Implement a method for modifying employee data (first name and last name) java.”

The code is generated by OpenAI (2023) ChatGPT 3.5:

```
package com.example;
import java.util.ArrayList;

class Employee {
    private String firstName;
    private String lastName;
    private String dateOfBirth;
    private String teamName;

    public Employee(String firstName, String lastName, String dateOfBirth, String teamName) {
        this.firstName = firstName;
        this.lastName = lastName;
        this.dateOfBirth = dateOfBirth;
        this.teamName = teamName;
    }

    // Getters and setters for modifying first name and last name
    public String getFirstName() {
        return firstName;
    }
    public void setFirstName(String firstName) {
        this.firstName = firstName;
    }
    public String getLastName() {
        return lastName;
    }
}
```

```

public void setLastName(String lastName) {
    this.lastName = lastName;
}

// Other getters and setters for dateOfBirth and teamName
// ...

@Override
public String toString() {
    return "Employee [firstName=" + firstName + ", lastName=" + lastName
        + ", dateOfBirth=" + dateOfBirth + ", teamName=" + teamName + "];"
}
}

class Team {
    private String teamName;
    private String teamId;
    public Team(String teamName, String teamId) {
        this.teamName = teamName;
        this.teamId = teamId;
    }

    // Getters and setters for teamName and teamId
    // ...

    @Override
    public String toString() {
        return "Team [teamName=" + teamName + ", teamId=" + teamId + "];"
    }
}

class Admin {
    private ArrayList<Employee> employees = new ArrayList<>();
    private ArrayList<Team> teams = new ArrayList<>();

    // Add data to the employee list
    public void addEmployee(String firstName, String lastName, String dateOfBirth, String teamName) {
        Employee employee = new Employee(firstName, lastName, dateOfBirth, teamName);
        employees.add(employee);
    }

    // Add data to the team list
    public void addTeam(String teamName, String teamId) {
        Team team = new Team(teamName, teamId);
        teams.add(team);
    }

    // Implement a method for modifying employee data (first name and last name)
    public void modifyEmployeeName(int employeeIndex, String newFirstName, String newLastName) {
        if (employeeIndex >= 0 && employeeIndex < employees.size()) {
            Employee employee = employees.get(employeeIndex);
            employee.setFirstName(newFirstName);
            employee.setLastName(newLastName);
        } else {
            System.out.println("Employee not found at index " + employeeIndex);
        }
    }
}

```

```

}

// Other methods for managing data
// ...

public ArrayList<Employee> getEmployees() {
    return employees;
}
public ArrayList<Team> getTeams() {
    return teams;
}
}

public class Main {
    public static void main(String[] args) {
        Admin admin = new Admin();
        admin.addEmployee("John", "Doe", "1990-01-15", "Team A");
        admin.addEmployee("Jane", "Smith", "1985-07-25", "Team B");

        System.out.println("Initial employee list:");
        for (Employee employee : admin.getEmployees()) {
            System.out.println(employee);
        }
        admin.modifyEmployeeName(0, "New John", "New Doe");
        System.out.println("\nModified employee list:");
        for (Employee employee : admin.getEmployees()) {
            System.out.println(employee);
        }
    }
}

```

End of the code.

The output:

Initial employee list:

Employee [firstName=John, lastName=Doe, dateOfBirth=1990-01-15, teamName=Team A]

Employee [firstName=Jane, lastName=Smith, dateOfBirth=1985-07-25, teamName=Team B]

Modified employee list:

Employee [firstName=New John, lastName=New Doe, dateOfBirth=1990-01-15, teamName=Team A]

Employee [firstName=Jane, lastName=Smith, dateOfBirth=1985-07-25, teamName=Team B]

Test result: The Visual Studio editor did not point out any syntactic errors in the initial code. The output produced by the code presents how one of the code functions works. The code functionality follows the instructions listed in the prompt. The code includes commentaries and follows Java coding conventions.

Appendix 4. IT Roles and Generative AI tools that can be applied to it, version 2.

IT Role	Generative AI Tool Example	Functions	Specialists' evaluation
Web Development, Software Development, Database Development, AI Development etc.	ChatGPT and/or other chatbots based on NLP model	Generation of code in different languages based on the prompt (basic). Quick generation of applications documentation	Useful tool, but sometimes code has syntax errors or there are problems with code logic
	GitHub Copilot, TabNine and/or other code-generating tools	Generation of code in different languages based on the prompt (advanced). Code writing suggestions, bug fixing, code style improvement, code refactoring	Copilot is a great assistance tool, heavily reduces time of writing code
	Sivi AI	Produces a design layout from a photo, gives out several variants that can be customized. Produces code for the design	Useful tool for the frontend tasks, but current version is primitive in functionality
Data Engineering	ChatGPT	SQL/Python code generation(basic), database documentation generation, translation of code from one language/dialect to another, data pipeline boilerplate generation	
	GitHub Copilot	SQL/Python code generation(advanced), code writing suggestions, bug fixing, code style improvement, code refactoring	

Web Design (UI, UX)	ChatGPT and/or other chatbots based on NLP model	Placeholder text generation	Can generate text fast and reduces time spent on this task
	Uizard Autodesigner and/or other design-generating tools	Mockup generation from the text prompt	Useful for junior designers, or as an inspiration tool since the functionality is primitive, but the tool is promising
	Visual Copilot, Figma Generative AI plugin by Builder.io	Generate Figma designs from the text prompt, convert design to a code	
	DALL-E, and/or other image-generating tools	Generation of images for the specific design	
	Adobe Firefly	Generation of images, text affects and color palettes, safe for commercial use	A tool that does not violate copyright of the images or digital illustrations which is a huge benefit
Application Testing	ChatGPT and/or other chatbots based on NLP model	Generation of the test cases in different languages based on the text prompt (basic). Generating of the test data	
	Testsigma test-generation tool and/or other test-specific code-generation tools	Generation of the test cases in different languages based on the text prompt (advanced)	

Low-code development	Retool AI tools (Retool AI, Ask AI)	Generation of text, images, populating return forms, writing support tickets. Generation of JavaScript, SQL or GraphQL queries from the prompt instructions, edit existing queries, queries explanation, comments addition, errors fixing. Built-in OpenAI support	
Technologies to look out for	AutoGPT	Open-source model based on GPT-4 that can potentially solve complex problems	Predecessor of the Generative AI System 2
	CodeLlama	Open-source code-generating AI based on Meta Llama 2 model	Potentially can be used to deploy a code-generator for a small company
	Bubble No-Code Copilot	Future Generative AI tool that will generate Bubble application components from the prompt and modify them	