

Generative AI in the Workplace: Effects on Employee Efficiency and Performance

Bachelor's Thesis
Remu Keltanen
Aalto University School of Business
Information and Service Management
Summer 2024

Author Remu Keltanen

Title of thesis Generative AI in the Workplace: Effects on Employee Efficiency and Performance

Degree Bachelor's degree

Degree programme Information and Service Management

Thesis advisor(s) Lauri Viitasaari

Year of approval 2024**Number of pages** 28**Language** English

Abstract

The objective of this thesis is to explore how the use of generative artificial intelligence (AI) in the workplace affects employee performance. Through a comprehensive review of existing literature and research on the topic, the findings suggest that generative AI has the potential to enhance employee productivity across various tasks by automating routine processes, freeing up time for more complex activities, improving output quality, reducing skill gaps among employees, and fostering creativity and innovation. However, the use of generative AI in the workplace also presents challenges, including the need to understand its capabilities, recognize false information, address potential negative impacts on high-skilled workers, and navigate privacy, security, and the efficient utilization of this technology.

Keywords Generative AI, Employee productivity, LLM, Artificial Intelligence, Workplace

Tekijä Remu Keltanen

Työn nimi Generatiivinen tekoäly työpaikalla: vaikutukset työntekijöiden tehokkuuteen ja suorituskykyyn

Tutkinto Kandidaatintutkielma

Koulutusohjelma Tieto- ja palvelujohtaminen

Työn ohjaaja Lauri Viitasaari

Hyväksymisvuosi 2024

Sivumäärä 28

Kieli Englanti

Tiivistelmä

Tämän tutkielman tavoitteena on selvittää, miten generatiivisen tekoälyn käyttö työpaikalla vaikuttaa työntekijöiden suorituskykyyn. Olemassa olevan kirjallisuuden ja tutkimusten tarkastelun kautta tulokset osoittavat, että generatiivinen tekoäly voi parantaa työntekijöiden tuottavuutta useissa tehtävissä automatisoimalla työtehtäviä, vapauttamalla aikaa monimutkaisemmille tehtäville, parantamalla työn laatua, pienentämällä työntekijöiden välistä taitotasoa sekä edistämällä luovuutta ja innovaatiota. Generatiivisen tekoälyn käyttö työpaikalla tuo kuitenkin mukanaan myös haasteita, kuten tarpeen ymmärtää sen kyvykkyydet, tunnistaa virheellistä tietoa, käsitellä mahdollisia negatiivisia vaikutuksia taitaviin työntekijöihin sekä navigoida yksityisyys-, turvallisuus- ja tehokkaan hyödyntämisen kysymyksiä.

Avainsanat Generatiivinen tekoäly, Työntekijän tuottavuus, LLM, Tekoäly, Työpaikka

Table of Contents

Abstract

1. Introduction	2
1.1. Research objectives and research questions	3
1.2. Scope of research	3
1.3. Methodology	3
1.4. Structure of the research	3
2. Understanding generative AI	5
2.1. Introduction to generative AI	5
2.2. Large Language Models and GPT-4	6
3. Effects of generative AI on employee productivity	8
4. Enhancing employee performance with generative AI	10
4.1. Automation of routine tasks	10
4.2. Support creativity and innovation	11
4.3. Impact on job satisfaction and engagement	12
4.4. Data-driven insights	12
4.5. Reduction in performance inequality	13
4.6. Role of AI in employee development	14
5. Challenges and risks of using generative AI at workplace	15
5.1. AI hallucinations and false information	15
5.2. Understanding capabilities of generative AI	16
5.3. Influence on high-skilled workers	16
5.4. Efficient prompt engineering	17
5.5. Privacy and security concerns	18
5.6. Ethical considerations and AI bias	19
6. Discussion and conclusions	20
6.1. Implications to practice	21
6.2. Limitations and future research	21
References	23

1. Introduction

We are currently at a place where human intelligence and artificial intelligence (AI) are crossing paths. Top-quartile human performance still outperforms artificial intelligence in the majority of tasks, but according to estimates, AI is expected to catch up and pull ahead of human intelligence in the next decade in various aspects such as creativity, problem-solving, and natural language generation (Chui et al., 2023).

Computers and technological advancements have led to substantial increases in productivity and transformed the economy by completing tasks with greater precision, speed, and consistency than humans. However, until recent advancements in the field of generative AI, computers have mostly automated routine tasks that require detailed and explicit instructions to translate inputs into outputs. Many workplace activities, such as writing emails, analyzing data, creating presentations, and solving problems, rely on tacit knowledge and thus have remained resistant to automation (Brynjolfsson et al., 2023)

Rapid technological advancements in generative AI in the last few years and the release of ChatGPT by OpenAI have demonstrated remarkable capabilities in the generation of human language, creative content, and assisting in problem-solving (Dell'Acqua et al., 2023). This shows a lot of potential for improving organizational productivity and has sparked considerable interest in understanding how these technologies could be best used to enhance employee productivity and efficiency (Naqbi et al., 2023). Potentially revolutionizing how work is completed in various industries (Dwivedi et al., 2023).

Despite the potential of generative AI technologies, their adaptation to workplaces is in its early stages; they are only beginning to be used by employees, and very little is known about their impact on employee performance and productivity (Brynjolfsson et al., 2023).

This thesis seeks to explore how generative AI tools affect employee performance and efficiency by thoroughly reviewing current literature and empirical studies on the subject. This research paper explores the advantages of utilizing generative AI tools for enhancing employee performance, as well as acknowledging the obstacles and potential dangers involved in their implementation in a professional setting.

1.1. Research objectives and research questions

The objective of this thesis is to find out how the use of generative AI, specifically tools like GPT models, affects employee productivity and performance. Based on existing literature, this thesis will address the challenges and possibilities emerging from the use of generative AI in the workplace.

Research question: How does the use of generative AI affect employee performance?

1.2. Scope of research

This research mainly focuses on the general effects of the use of generative AI on employees' performance and completion of tasks. This research mainly focuses on employees in office jobs and knowledge work, as physical labour is not directly affected by generative AI.

1.3. Methodology

The research methodology used in this paper involves a comprehensive literature review of relevant research and articles on generative AI and employee productivity. The primary search engine used to find scholarly papers is Scopus. Additionally, Google Scholar and Consensus.ai were utilized to find relevant literature.

Keywords such as “generative AI,” “employee productivity,” and “ChatGPT” were employed to find literature aligned with the research question and objectives. From the retrieved articles, the most relevant were selected, with an emphasis on recency.

This focus on recent studies is crucial because generative AI has developed significantly in just the past few years, rendering research conducted more than five years ago potentially outdated.

1.4. Structure of the research

This thesis is structured into 6 chapters. Chapter 1 introduces the research topic, presents the research questions, defines the scope of the study, and outlines the methodology employed.

Chapter 2 introduces generative AI and large language models. Chapter 3 introduces recent literature on the use of generative AI tools, such as ChatGPT, and their impact on employee productivity. This chapter reviews empirical studies that have examined how the use of generative AI in the workplace has affected employee performance.

Chapter 4 examines how generative AI has improved or could potentially improve employee productivity in the future and specifies factors that affect efficient use of generative AI in the workplace.

Chapter 5 explores the challenges, risks, and possible negative effects that the use of generative AI can have on employee performance. Chapter 6 includes discussion of findings and conclusions.

2. Understanding generative AI

This chapter provides an overview of generative AI, covering its historical background, key technological developments, and recent progress like the launch of ChatGPT-4. It also underscores the significance of the development of large language models (LLMs) for natural language processing and generation.

2.1. Introduction to generative AI

In simple terms, generative AI is algorithms that can create new content, like, text, pictures, music, or data, by learning from existing data. This technology has seen a lot of great advancements in recent years, with many developers and researchers contributing to its current capabilities.

Generative AI is based on machine- and deep-learning algorithms. The story of generative AI started in 1952, when the term machine learning was first used by the creator of the first machine learning algorithm, Arthur Samuel. While the first example of generative AI is considered to be ELIZA, created and developed by Joseph Weizenbaum in the 1960s, Eliza was a talking computer program that could understand human language inputs and answer in natural language (Weizenbaum, 1966).

More recent breakthroughs in the field of generative artificial intelligence include the creation of Generative Adversarial Networks (GANs) in 2014 by Ian Goodfellow. GAN is an unsupervised machine learning algorithm that uses two neural networks competing with each other: a generative model that generates content and a discriminative model that tries to determine if the generated content is authentic or not (Goodfellow et al., 2014). This advancement was important in understanding the capabilities of picture and video creation by AI.

In 2017, transformer models were introduced by Ashish Vaswani, which again revolutionized the capabilities of generative AI. Transformer models enabled more efficient methods to process data (Vaswani et al., 2017) and made way for models like BERT (Bidirectional Encoder Representations from Transformer) and GPT (Generative Pre-trained Transformer). These models introduced outstanding capabilities in the generation of human-like language by producing coherent text based on little input.

Alongside these advancements, Natural Language Processing (NLP) took big steps forward. NLP regards how computers and humans communicate, allowing computers to

understand, analyze, and generate human language. In 2018, OpenAI introduced GPT, which uses a transformer-based architecture and is pre-trained on a huge amount of data. These two factors together allowed it to generate consistent and coherent human-like text with capabilities not seen before. Setting a new standard for what can be achieved with generative artificial intelligence.

2.2. Large Language Models and GPT-4

Large language models are a type of generative AI specifically designed to understand and generate human language. In recent years, the capabilities of large language models have expanded impressively due to technological advancement, and they are now able to perform even complex tasks, which has increased research and interest in them (Naveed et al., 2023).

Many of the most advanced generative AI tools are based on large language models, including models like GPT-4 (Generative Pre-trained Transformer 4) by Open AI, LLaMA by Meta, and BERT and T5 by Google.

In a nutshell, large language models are neural networks trained using machine and deep learning algorithms. Their training process involves extremely large datasets. These datasets include, for example, academic publications, blog posts, online discussions, books, and websites (Zhao et al., 2023). This training allows large language models to recognize patterns and grammar in human language in a way that is comparable to how humans learn language (Azaria et al., 2024). By analyzing this data, LLMs learn to generate content by predicting the next word.

Existing research has found many applications for LLMs in various fields, including finance, medicine, education, and more (Zhou et al., 2023). These applications demonstrate the broad potential of LLMs to transform different industries by improving efficiency, enhancing decision-making, and enabling new capabilities.

Possibly the most popular and advanced example of large language models is chatbot GPT-4, developed by OpenAI and released in March 2023. This model was a major upgrade from its predecessor, GPT-3.5, by achieving human-level performance in various professional and academic benchmarks (OpenAI et al., 2023). Major advancements included its improved capability to understand human language and its improved ability to reason about its outputs. GPT-4 is also able to understand image inputs in addition to text inputs (Wu et al., 2024).

GPT-4 has demonstrated great capabilities in language comprehension and generation, engaging in user interactions through dialogues, allowing it to handle a wide range of tasks and deliver detailed explanations. (Mao et al., 2023).

3. Effects of generative AI on employee productivity

The impact of generative AI on employee productivity has become a topic of growing interest within the academic and business communities. Generative AI, with its ability to assist in tasks such as content creation, data analysis, and problem-solving, has the potential to enhance the efficiency and effectiveness of employees across a wide range of professions.

In a study conducted with customer service agents, Brynjolfsson et al. (2023) found that generative AI increased the productivity of agents by 14%, when measured by the number of customer problems solved per hour. Indicating that generative AI has a significant potential for increasing efficiency in routine customer service tasks.

Noy and Zhang (2023) investigated the effects of ChatGPT on university-educated professionals tasked with writing assignments each relevant to their profession. The results showed that access to ChatGPT resulted in a substantial 40% decrease in the average time required to complete the task. Underlining the potential of generative AI to increase productivity in tasks that require extensive writing and content creation.

Access to generative AI tools, like GitHub Copilot, increased software developers' productivity by 55.8% by allowing them to complete tasks at a faster pace (Peng et al., 2023). Similarly, Dell'Acqua et al. (2023) found that in a study with 700 Boston Consulting Group consultants, those who used ChatGPT completed their tasks 25.1% quicker.

Kroinek (2023) estimated that economists could be 10–20% more productive when using large language models based on 25 use cases for LLM's. Fauzi et al. (2023) expect that ChatGPT can have a significant positive effect on student productivity by providing them with useful information and resources, improving language skills, time efficiency, and effectiveness. Facilitating collaboration and providing students with support and motivation.

It seems certain that generative AI packs a huge potential to increase employee productivity, and using it as a co-worker in a workplace could have global effects on productivity statistics. Productivity is usually measured by dividing output by an index of hours worked. But many studies have found that the quality of the work has increased at the same time.

Brynjolfsson et al. (2023) found a positive impact of AI assistance on customer service chat quality when measured by customer satisfaction and resolution rates. The work

done by consultants with AI assistance produced 40% higher-quality results compared to the control group, which had no access to AI. (Dell'Acqua et al., 2023). However, this was when the task was planned so that it was within the capabilities of AI. Noy and Zhang (2023) found an 18% increase in output quality in writing tasks.

4. Enhancing employee performance with generative AI

As noted in the prior section, the use of generative AI tools has shown great promise in enhancing worker productivity and efficiency across different industries. By enhancing the effectiveness of customer service agents, software developers, consultants, and students, as well as decreasing the time needed for university-educated professionals to finish writing tasks.

Chapter 4 explores how generative AI tools can enhance employee performance in more detailed ways. This section delves into the utilization of generative AI tools for task automation, supporting low-skilled workers, bringing down performance gaps, and supporting workplace creativity and innovation. While also looking into the impact generative AI has on employee satisfaction.

The impact of generative AI on employee productivity differs from previous technological advancements in two major ways. Firstly, productivity improvements are more pronounced for low-skilled workers compared to high-skilled workers (Dell'Acqua et al., 2023; Brynjolfsson et al., 2023; Noy & Zhang, 2023).

Over the past decades, technological advancements have primarily enhanced the productivity of high-skilled workers and increased job displacement among low-skilled workers. This trend has also contributed to growing inequality and wage disparity among employees (Acemoglu, 2002).

Secondly, for perhaps the first time, productivity significantly improves in tasks requiring cognitive skills and creativity, such as writing emails, generating ideas, and solving problems (Brynjolfsson et al., 2023). In contrast, previous waves of automation have primarily focused on mechanical automation for physical labor and software automation for handling repetitive, rule-based tasks (Noy & Zhang, 2023).

In the following section, we will look into the main characteristics of generative AI and how they can influence employee productivity and the future of work.

4.1. Automation of routine tasks

One significant way generative AI enhances employee productivity is through the automation of routine tasks. A study by Noy and Zhang (2023) demonstrated that the use of ChatGPT reduced the time required to complete writing tasks by 40%. This leaves employees with more time for complex or strategic tasks.

Automation is particularly effective for tasks such as writing emails, creating PowerPoint presentations, and generating reports. This efficiently frees up human resources for higher-value tasks (Al Naqbi et al., 2024). More specifically, ChatGPT is particularly valuable for the generation of initial drafts, whether it's an email, report, blog post, or business plan (Dwivedi et al., 2023).

Among knowledge workers, on average, 41% of their worktime is used for activities that could be performed by others (Birkinshaw & Cohen, 2013). Recent advancements in generative AI tools such as ChatGPT make it possible to handle such repetitive tasks as writing code or reports. (Dwivedi et al., 2023). The findings by Dell'Acqua et al. (2023) align with this, as their study discovered that consultants on average completed their tasks 25% more quickly with access to ChatGPT-4.

By collaborating with AI tools, employees can leverage the strengths of both human creativity and the efficiency of AI. For example, generative AI can quickly create first drafts, analyze large datasets, summarize texts, or generate content. Human employees are essential for providing context, making decisions, and applying creative thinking to AI-generated outputs.

4.2. Support creativity and innovation

The use of generative AI in the workplace has shown significant potential for fostering innovation and creativity. Generative AI can produce new content, including text, images, or audio, that is often hard to distinguish from human-created work. (Feuerriegel et al., 2024). Recent studies have underlined that ideas generated with the use of ChatGPT tend to be of higher quality than those generated by humans (Dell'Acqua et al., 2023; Girotra et al., 2023; Boussioux et al., 2023).

One primary way that the use of generative AI tools can foster innovation is by augmenting the early stages of innovation and ideation. (Bilgram & Laarmann, 2023). Generative AI tools can create a lot of content with just a short input prompt that could help humans find new perspectives and ideas that they would not have thought of independently. Generative AI is also good at combining and communicating ideas where many humans may struggle (Magni et al., 2024).

Although the use of generative AI tools aids in producing better ideas. Study by Dell'Acqua et al. (2023) shows that it can also lead to less variability in ideas. This

suggests that while AI can enhance the efficiency and quality of idea generation, it might lead to more homogeneous ideas.

4.3. Impact on job satisfaction and engagement

Multiple studies confirm that there is a positive correlation between job satisfaction and employee performance (Judge et al., 2001; Alessandri et al., 2017). Employees with higher job satisfaction levels tend to show greater enthusiasm, motivation, and engagement, leading to improved performance.

While the long-term effects on job satisfaction from the use of generative AI at the workplace remain unknown, some studies have shown a positive correlation between the use of generative AI in the workplace and job satisfaction. Noy & Zhang (2023) found that the use of generative AI in writing tasks increased job satisfaction. Brynjolfsson et al. (2023) witnessed a decrease in workforce turnover rates among customer service agents after they were allowed access to generative AI assistance.

A study by Shchepkina et al. (2024) found a major 20,6% increase in employee job satisfaction in the industrial sector after the implementation of AI. Increases in job satisfaction are mostly attributed to the automation of routine, repetitive tasks. This allows employees to focus on more creative and interesting tasks that they might find more fulfilling.

Although Brynjolfsson et al. (2023) point out that the use of generative AI tools might not lead to an increase in employee satisfaction, if employees feel more pressure to work faster and faster.

4.4. Data-driven insights

Recent advancements in LLM's computing power have allowed businesses to use AI in real-time decisions and projects (Kar & Kushwaha, 2021). Generative AI can quickly analyze large amounts of data. It can also generate new content from the data that it has received (Feuerriegel et al., 2024), and provide insights that could be overseen by humans. This capability is especially important in fields such as finance, logistics, and healthcare, where accurate and timely decision-making is crucial. (Naqbi et al., 2024).

It's important to notice that the current state of generative AI does not substitute for a decision-making expert, it is constantly evolving and is a promising tool that can be helpful for decision-making experts. (Chuma & De Oliveira, 2023)

4.5. Reduction in performance inequality

Generative AI has already achieved median human-level performance in natural language generation and understanding, creativity, problem-solving, and output articulation and presentation (Chui et al., 2023). Generative AI also seems to enhance output quality, specifically on writing tasks. In a study by Noy and Zhang (2023), use of ChatGPT resulted in an 18% improvement in output quality in written assignments. Dell'Acqua et al. (2023) found an over 40% increase in work quality in consultant tasks that were designed to be inside ChatGPT's capabilities.

The improvement was attributed to generative AI's ability to produce well-structured, grammatically and contextually correct content, thus ensuring high-quality work. AI tools can read files in seconds and point out mistakes and provide feedback.

Most studies where the effects of generative AI on the workforce have been studied seem to follow a similar pattern where the work performance and productivity of low-skilled employees' work seem to be more affected than high-skilled employees' work. Study by Björnolfsson et al. (2023) found a 34% improvement in the productivity of low-skilled or novice customer service agents, whereas the use of generative AI had a minimal effect on the productivity of high-skilled agents.

Similarly, Choi & Schwarcz (2023) reported that the use of generative AI had a large positive effect on the exam scores of low-performing students, whereas the effect on top-performing students was minimal or, in some cases, even negative. A study by Dell'Acqua et al. (2023) found that the use of generative AI led to a 17% increase in the work quality of high-skilled consultants and a 43% increase in the work quality of below-average-performing consultants.

The use of generative AI at the workplace could allow less-skilled workers to achieve performance levels closer to those of their more skilled colleagues, thus helping to reduce performance inequality among workers. (Björnolfsson et al., 2023). A reduction in performance inequality could lead to a more balanced, cooperative, and productive workforce. Overall, these findings indicate that organizations could potentially see the

largest productivity benefits from the utilization of generative AI in their business practices, helping low-skilled workers perform better.

4.6. Role of AI in employee development

As already mentioned in the previous chapter, generative AI seems to affect the productivity of low-skilled workers more than the productivity of high-skilled workers. (Noy & Zhang, 2023; Dell'Acqua et al., 2023; Brynjolfsson et al., 2023). Another aspect where generative AI is helpful for low-skilled workers is employee training. Large language models can identify characteristics, patterns, or behaviors that differ between high- and low-skilled workers. (Brynjolfsson et al., 2023)

Generative AI can capture and replicate the best practices of the company's highly skilled employees, making these practices accessible to the rest of the workforce. Which would help low-skilled workers catch up with high skilled workers more quickly and reduce skill levels between employees, making the workforce more equal and help novice employees to move down more quickly on the experience curve (Brynjolfsson et al., 2023).

AI could also be used to identify each employee's knowledge base. Employees from different backgrounds and education levels can have different prior information and skills; therefore, providing everyone with the same learning materials or programs can be a waste of time and resources.

Generative AI can create personalized learning programs for employees, considering their knowledge base and learning styles. Reducing costs for companies, minimizing the learning period, and increasing the efficiency of learning. (Noor et al., 2020)

5. Challenges and risks of using generative AI at workplace

While the potential of generative AI shows great potential in enhancing employee performance, as discussed in the previous chapter, it is equally important to consider the challenges and risks associated with its use in the workplace.

Chapter 5 explores the challenges and risks that organizations may face when integrating generative AI into their operations and providing employees with generative AI tools. These challenges include for example, the potential for AI to generate false information and the complexity of understanding the capabilities of generative AI.

Further, the chapter examines the impact of generative AI on highly skilled workers, the importance of skilful prompting to use generative AI tools efficiently, privacy and security concerns, and ethical considerations regarding the use of generative AI in the workplace. For organizations, it is important to address these challenges before they start using generative AI tools to avoid possible pitfalls.

5.1. AI hallucinations and false information

The use of generative AI tools like ChatGPT in the workplace introduces significant risks related to the accuracy and reliability of the information they produce. The ease with which these systems can generate human-like text raises the risk of employees using them to accidentally produce content that may be misleading or inaccurate (Zhou et al., 2023). This could weaken the integrity of the work produced, decrease trust in the organization, and potentially lead to legal or reputational consequences (Michael-Villarreal et al., 2023)

ChatGPT offers responses that seem credible but can be factually inaccurate. The system lacks transparency in its data collection methods for answering questions and occasionally generates information that appears believable but is fabricated, making it unreliable for complex questions. (Branum & Schiavenato, 2023). ChatGPT is also known for generating citations and references that are fake due to its predictive process (Day, 2023).

The complex functionality of generative AI adds another layer to this problem, as it is almost impossible, even for experts, to understand how these systems arrive at certain responses or conclusions (Rudin & Radin, 2019). This lack of transparency makes it hard for employees to verify AI-generated text and content.

Generative AI can create a false sense of reliability by giving answers that seem credible and correct but actually contain false information. (Wu et al., 2024). This raises concerns about whether employees are able to distinguish misinformation in AI-generated content, as it has been shown that misinformation generated by AI is more convincing than misinformation generated by humans (Spitale et al., 2023).

5.2. Understanding capabilities of generative AI

One major challenge for employees is deciding when to use generative AI for help and when not. The capabilities of large language models have increased significantly in just the last few years, and it's even difficult for the developers of generative AI to understand what kind of task they can complete better than humans.

Tasks that were designed so that they were outside the capabilities of ChatGPT-4. Humans relied too much on AI and were more likely to make mistakes. Groups using AI were 19 percentage points more likely to give incorrect answers, and overall, AI's output was less useful and inaccurate. (Dell'Acqua et al., 2023).

In a study by Otis et al. (2024) conducted with entrepreneurs, researchers found that low-performing entrepreneurs using generative AI assistance performed 8% worse than their counterparts without access to AI. The researchers suggested that this poorer performance was due to these entrepreneurs seeking AI for help with overly complex and challenging business tasks.

This highlights the need for employees to learn to understand which work tasks can be best completed with the use of generative AI. Employees must also learn to understand how to interact with generative AI tools based on assigned tasks, whether AI should be used to automate tasks completely, used as a co-worker to complement human intelligence, or if generative AI should be used at all.

5.3. Influence on high-skilled workers

While generative AI has already reached median human performance in many types of technical capabilities, such as natural language generation and output articulation, it still falls behind top-quartile human performance in almost everything (Chui et al., 2023).

Choi and Schwartz's (2023) research on law students found that the use of generative AI was harmful for top-of-class students and even had a negative effect on their exam scores. Among highly skilled workers, the effects of generative AI are not as significant as among low-skilled workers, and their performance might even suffer negative effects from the use of AI. In tasks inside AI's capabilities, highly skilled workers performed tasks faster and better with access to AI, but in tasks outside of the capabilities of AI, their performance worsened, and they relied too much on AI. (Dell'Acqua et al., 2023)

Brynjolfsson et al. (2023) found similar results among customer service agents, where the use of generative AI can distract top performers or lead them to choose the faster option provided by generative AI instead of taking the time and coming up with their own responses. Their study also found negative effects on customer satisfaction rates when high-skilled workers were allowed access to generative AI.

On the other hand, Dell'Acqua et al. (2023) argue that the negative effect of the use of generative AI among high-skilled workers is not due to their skill level but because they complete more complex and challenging tasks at work. These tasks can be beyond the capabilities of the current level of generative AI, thus making their answers less accurate and helpful.

Even though the use of generative AI among high-skilled workers did not lead to large productivity gains and, in some cases, even worsened the quality of work, it is important to notice that high-skilled employees can contribute to the development of organizations generative AI tools by providing them with useful data and best practices that are not visible in productivity statistics.

5.4. Efficient prompt engineering

Prompt engineering is the process of designing precise questions and instructions to efficiently use generative AI and guide it in creating accurate and relevant content. (Giray, 2023). The quality of generative AI's output is closely tied to the quality of instructions or prompts it receives. Detailed and well-crafted prompts lead to more valuable responses. (Robertson et al., 2024)

Many users of ChatGPT still lack the best practices and knowledge to efficiently interact with it (Dwivedi et al., 2023). This lack of know-how limits the ability of employees and businesses to fully capitalize on the capabilities of generative AI from an economic perspective. (Noy & Zhang, 2023).

In a study by Dell'Acqua et al. (2023), it was found that consultants with access to ChatGPT-4, who were also provided with an overview of prompt engineering to increase their familiarity with AI, consistently produced better outputs and answers than consultants who did not receive such an overview. This resulted in more correct answers, a higher number of completed tasks, and a decrease in time spent.

Choi & Schwarcz (2023) found that the performance of ChatGPT-4 varies significantly depending on the prompting methodology. With basic prompts, it performed at the level of a mediocre student, but with optimal prompts, it outperformed even average students with access to AI.

By adopting effective AI prompting techniques, organizations can amplify human capabilities and foster collaboration between humans and AI. This integrated approach boosts overall productivity and efficiency, harnessing the strengths of both to achieve greater success. (Kanbach et al., 2023).

5.5. Privacy and security concerns

The use of generative AI tools in the workplace introduces security and privacy challenges. One primary concern is the potential for data leakage. Employees may accidentally input sensitive or confidential company or client information into generative AI tools. For example, Samsung banned the use of ChatGPT from its employees after sensitive company information was leaked to ChatGPT. (Bloomberg News, 2023)

Specifically, the use of ChatGPT in the workplace has its risks, as ChatGPT lacks sufficient measures to protect personal data in compliance with GDPR. For instance, it may share users' data with third-party entities without asking for explicit consent from its users. (Wu et al., 2024).

Failure to safeguard sensitive information could lead to severe legal consequences and damage to the company's reputation. Organizations need to set strict rules and provide comprehensive training programs for employees to make sure risks are properly managed.

5.6. Ethical considerations and AI bias

Generative AI, while powerful and transformative, raises significant ethical considerations, particularly concerning AI bias and fairness. Generative AI tools like ChatGPT are trained with vast amount of data, these datasets may contain biases, and stereotypes. These biased training datasets can lead to inaccurate and biased responses (Ray, 2023; Dwivedi et al., 2023).

For instance, when asked to identify a good scientist based on gender and race, ChatGPT has shown a preference for white males, demonstrating a bias against women and non-white humans (Dwivedi et al., 2023).

Studies also argue whether generative AI will be used to displace or augment human labor. If it will be mostly used to automate jobs there is a risk of technological unemployment (Frank et al., 2019). Organizations should use a human-centric approach when integrating generative AI tools into their business practices to ensure that they will mostly augment human intelligence instead of replacing it.

6. Discussion and conclusions

The results of this study emphasize how the use of generative AI tools in the workplace can have a complicated and diverse influence on employee productivity and performance. Generative AI tools, such as ChatGPT, has shown great promise in increasing efficiency in a range of activities. Nonetheless, integrating this technology into the work environment comes with considerable risks that need to be handled with care.

The main advantage of generative AI in office jobs is its capacity to automate and expedite mundane tasks for employees. Enabling employees to devote their attention to intricate and strategic assignments that demand human creativity, critical thinking, decision-making, emotional skills, or other activities where human intelligence outperforms artificial intelligence. This factor could also enhance employee satisfaction with their jobs and create a deeper sense of purpose and fulfillment in their work. (Noy & Zhang, 2023)

Generative AI seems to be most useful in writing, where it already generates higher-quality text than the average human (Chui et al., 2023). Employing generative AI tools has been discovered to improve the quality of work across a wide range of industries and tasks. The utilization of generative AI appears to be especially advantageous for less experienced workers, as it can speed up skill development (Brynjolfsson et al., 2023) and greatly improve the work quality of novice workers (Dell'Acqua et al., 2023; Brynjolfsson et al., 2023).

The results of the research show that incorporating generative AI into the workplace has the potential to boost employee productivity, but its implementation must be carefully controlled to prevent potential drawbacks. Businesses must make a commitment to providing their employees with proper training before integrating generative AI tools into their business practices.

One of the biggest concerns is the possibility of AI-generated content having mistakes or false information. Generative AI has the capability to produce content and text that seems highly believable to the reader, even though it may contain inaccurate or false information. Verifying AI-created content is challenging because of the complex technology and lack of transparency in LLMs.

Identifying the constraints and finding the optimal scenarios for utilizing generative AI is a crucial to successfully implement this technology into workplaces. Several research studies (Dell'Acqua et al., 2023; Brynjolfsson et al., 2023; Otis et al., 2023) have found

that using generative AI for tasks that are too difficult or beyond its capabilities can lead to negative effects on the quality of work.

These results bring up important questions about the ability of employees to recognize the right time to utilize generative AI versus relying on human expertise. Additionally, there is worry that highly skilled workers may depend too much on AI, opting for speed over utilizing their own expertise and judgment when completing tasks. Relying too much on artificial intelligence may cause a drop in work quality and possibly devalue human intuition, creativity, and expertise in the workplace.

6.1. Implications to practice

The findings of this thesis are highly beneficial for companies and organizations considering the implementation of generative AI in the workplace. Understanding the challenges and risks associated with generative AI is particularly crucial to avoid potential pitfalls during its adoption.

The results indicate that companies should provide their employees with comprehensive training programs to fully leverage the advantages of this technology. Early and successful adoption of generative AI can offer businesses a competitive edge in the market by reducing costs and enhancing both employee efficiency and work quality.

Furthermore, the findings indicate that companies could benefit the most from the utilization of generative AI in their business practices by helping low-skilled employees perform better. The use of generative AI had the largest quality and productivity enhancements among low-skilled employees, and its use helped employees learn quicker, resulting in them catching up with more skilled colleagues faster.

6.2. Limitations and future research

This literature review primarily focuses on empirical studies examining the effects of generative AI on employee performance. Noy and Zhang (2023) studied generative AI's ability to assist employees with writing tasks, while Brynjolfsson et al. (2023) investigated its impact on customer service.

Research by Otis et al. (2024) explored the influence of generative AI on entrepreneurial performance. Dell'Acqua et al. (2023) examined the effects of generative AI on the

productivity of high-knowledge workers, and Peng et al. (2023) focused on its impact on developer productivity.

This presents a limitation, as the studies referenced are from different fields of labor, meaning the conclusions cannot be universally applied across all sectors. Instead, the findings are intended to be more general and indicative.

Future research should focus on how to most effectively utilize generative AI in the workplace, identifying which tasks can be completed with it, and determining the tasks where it is most beneficial. Additionally, more field-specific empirical research should be conducted, such as examining the impact of generative AI on the productivity of sales and marketing professionals.

More research should also be conducted on the long-term effects of using generative AI in the workplace, including its impact on creativity, job satisfaction, learning, and the labor market.

References

- Acemoglu, D. (2002). Technical change, inequality, and the labor market. *Journal of Economic Literature*, 40(1), 7-72. <https://doi.org/10.1257/0022051026976>
- Alessandri, G., Borgogni, L., & Latham, G. P. (2016). A Dynamic Model of the Longitudinal Relationship between Job Satisfaction and Supervisor-Rated Job Performance. *Applied Psychology*, 66(2), 207–232. <https://doi.org/10.1111/apps.12091>
- Azaria, A., Azoulay, R., & Reches, S. (2024). ChatGPT is a Remarkable Tool—For Experts. *Data Intelligence*, 6(1), 240–296. https://doi.org/10.1162/dint_a_00235
- Bilgram, V., & Laarmann, F. (2023). Accelerating innovation with Generative AI: AI-Augmented Digital Prototyping and Innovation methods. *IEEE Engineering Management Review*, 51(2), 18–25. <https://doi.org/10.1109/emr.2023.3272799>
- Birkinshaw, J., & Cohen, J. (2013). Make Time for Work that Matters. *Harvard Business Review*, 91(9), 115–120.
- Bloomberg News. (2023, May 2). *Samsung bans ChatGPT and other generative AI use by staff after leak*. Bloomberg. <https://www.bloomberg.com/news/articles/2023-05-02/samsung-bans-chatgpt-and-other-generative-ai-use-by-staff-after-leak?srnd=technology-vp&leadSource=uverify%20wall>
- Boussioux, L., Lane, J. N., Zhang, M., Jacimovic, V., & Lakhani, K. R. (2023). The Crowdless Future? How Generative AI is shaping the future of human crowdsourcing. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4533642>
- Branum, C., & Schiavenato, M. (2023). Can ChatGPT accurately answer a PICOT question? Assessing AI response to a clinical question. *Nurse Educator*, 48(5), 231–233. <https://doi.org/10.1097/nne.0000000000001436>

- Brynjolfsson, E., Li, D., & Raymond, L. (2023). Generative AI at work. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4426942>
- Choi, J. H., & Schwarcz, D. (2023). AI assistance in Legal Analysis: an Empirical study. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4539836>
- Chui, M., Hazan, E., Roberts, R., Singla, A., Smaje, K., Sukharevsky, A., Yee, L., & Zimmel, R. (2023). The economic potential of generative AI: The next productivity frontier. In *McKinsey & Company*.
<https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#business-and-society>
- Chuma, E. L., & De Oliveira, G. G. (2023). Generative AI for Business Decision-Making: a case of ChatGPT. *Management Science and Business Decisions*, 3(1), 5–11.
<https://doi.org/10.52812/msbd.63>
- Day, T. (2023). A preliminary investigation of fake Peer-Reviewed citations and references generated by ChatGPT. *The Professional Geographer*, 75(6), 1024–1027. <https://doi.org/10.1080/00330124.2023.2190373>
- Dell’Acqua, F., McFowland, E., Mollick, E. R., Lifshitz-Assaf, H., Kellogg, K., Rajendran, S., Kraymer, L., Candelon, F., & Lakhani, K. R. (2023). Navigating the jagged technological frontier: field experimental evidence of the effects of AI on knowledge worker productivity and quality. *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.4573321>
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., . . . Wright, R. (2023). Opinion Paper: “So what if ChatGPT wrote it?” Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy.

International Journal of Information Management, 71, 102642.

<https://doi.org/10.1016/j.ijinfomgt.2023.102642>

Fauzi, F., Tuhuteru, L., Sampe, F., Ausat, A. M. A., & Hatta, H. R. (2023). Analysing the role of CHATGPT in improving student productivity in higher education.

Journal on Education, 5(4), 14886–14891.

<https://doi.org/10.31004/joe.v5i4.2563>

Feuerriegel, S., Hartmann, J., Janiesch, C., & Zschech, P. (2023). Generative AI.

Business & Information Systems Engineering, 66(1), 111–126.

<https://doi.org/10.1007/s12599-023-00834-7>

Frank, M. R., Autor, D., Bessen, J. E., Brynjolfsson, E., Cebrian, M., Deming, D. J., Feldman, M., Groh, M., Lobo, J., Moro, E., Wang, D., Youn, H., & Rahwan, I. (2019). Toward understanding the impact of artificial intelligence on labor.

Proceedings of the National Academy of Sciences, 116(14), 6531–6539.

<https://doi.org/10.1073/pnas.1900949116>

Giray, L. (2023). Prompt Engineering with ChatGPT: A Guide for Academic Writers.

Annals of Biomedical Engineering, 51(12), 2629–2633.

<https://doi.org/10.1007/s10439-023-03272-4>

Girotra, K., Meincke, L., Terwiesch, C., & Ulrich, K. T. (2023). Ideas are Dimes a

Dozen: Large Language Models for Idea Generation in Innovation. *SSRN*

Electronic Journal. <https://doi.org/10.2139/ssrn.4526071>

Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S.,

Courville, A., & Bengio, Y. (2020b). Generative adversarial networks.

Communications of the ACM, 63(11), 139–144. <https://doi.org/10.1145/3422622>

Judge, T. A., Thoresen, C. J., Bono, J. E., & Patton, G. K. (2001). The job satisfaction–job performance relationship: A qualitative and quantitative review.

Psychological Bulletin, 127(3), 376–407. <https://doi.org/10.1037/0033-2909.127.3.376>

- Kanbach, D. K., Heiduk, L., Blueher, G., Schreiter, M., & Lahmann, A. (2023). The GenAI is out of the bottle: generative artificial intelligence from a business model innovation perspective. *Review of Managerial Science*.
<https://doi.org/10.1007/s11846-023-00696-z>
- Kar, A. K., & Kushwaha, A. K. (2021). Facilitators and Barriers of Artificial Intelligence Adoption in Business – Insights from Opinions Using Big Data Analytics. *Information Systems Frontiers*, 25(4), 1351–1374.
<https://doi.org/10.1007/s10796-021-10219-4>
- Korinek, A. (2023). Generative AI for Economic Research: Use cases and implications for economists. *Journal of Economic Literature*, 61(4), 1281–1317.
<https://doi.org/10.1257/jel.20231736>
- Magni, F., Park, J., & Chao, M. M. (2024). Humans as creativity gatekeepers: Are we biased against AI creativity? *Journal of Business and Psychology*, 19, 643.656 .
<https://doi.org/10.1007/s10869-023-09910-x>
- Mao, R., Chen, G., Zhang, X., Guerin, F., & Cambria, E. (2023). GPTEVAL: A survey on assessments of CHATGPT and GPT-4. *arXiv*.
<https://doi.org/10.48550/arxiv.2308.12488>
- Michel-Villarreal, R., Vilalta-Perdomo, E., Salinas-Navarro, D. E., Thierry-Aguilera, R., & Gerardou, F. S. (2023). Challenges and opportunities of Generative AI for higher Education as explained by ChatGPT. *Education Sciences*, 13(9), 856.
<https://doi.org/10.3390/educsci13090856>
- Naveed, H., Khan, A. U., Qiu, S., Saqib, M., Anwar, S., Usman, M., Barnes, N., & Mian, A. (2023). A comprehensive overview of large language models. *arXiv*.
<https://doi.org/10.48550/arxiv.2307.06435>

- Noor, N. I. A., Nassreddine, G., & Younis, J. (2023). Impact of artificial intelligence on employee development at Basrah University. *Journal of Techniques*, 5(2), 272–284. <https://doi.org/10.51173/jt.v5i2.1366>
- Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, 381(6654), 187–192. <https://doi.org/10.1126/science.adh2586>
- OpenAI, Achiam, J., Adler, S., Agarwal, S., Ahmad, L., Akkaya, I., Aleman, F. L., Almeida, D., Altenschmidt, J., Altman, S., Anadkat, S., Avila, R., Babuschkin, I., Balaji, S., Balcom, V., Baltescu, P., Bao, H., Bavarian, M., Belgum, J., ... Zoph, B. (2024). GPT-4 technical report. arXiv. <https://doi.org/10.48550/arXiv.2303.08774>
- Otis, N., Clarke, R. P., Delecourt, S., Holtz, D., & Koning, R. (2024). The uneven impact of Generative AI on entrepreneurial performance. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4671369>
- Peng, S., Kalliamvakou, E., Cihon, P., & Demirer, M. (2023). The Impact of AI on Developer Productivity: Evidence from GitHub Copilot. *arXiv*. <https://doi.org/10.48550/arxiv.2302.06590>
- Robertson, J., Ferreira, C., Botha, E., & Oosthuizen, K. (2024). Game changers: A generative AI prompt protocol to enhance human-AI knowledge co-construction. *Business Horizons*. <https://doi.org/10.1016/j.bushor.2024.04.008>
- Rudin, C., & Radin, J. (2019). Why are we using black box models in AI when we don't need to? A lesson from an explainable AI competition. *Harvard Data Science Review*, 1(2). <https://doi.org/10.1162/99608f92.5a8a3a3d>
- Shchepkina, N., Ramnarayan, N., Dhaliwal, N., K, R., & Nangia, R. (2024). Human-Centric AI adoption and its Influence on worker productivity: an Empirical

- investigation. *BIO Web of Conferences*, 86, 01060.
<https://doi.org/10.1051/bioconf/20248601060>
- Spitale, G., Biller-Andorno, N., & Germani, F. (2023). AI model GPT-3 (dis)informs us better than humans. *Science Advances*, 9(26).
<https://doi.org/10.1126/sciadv.adh1850>
- Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł., & Polosukhin, I. (2017). Attention is all you need. In *Proceedings of the 31st International Conference on Neural Information Processing Systems (NIPS'17)* (pp. 6000–6010). Curran Associates, Inc.
- Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. *Communications of the ACM*, 9(1), 36–45. <https://doi.org/10.1145/365153.365168>
- Wu, X., Duan, R., & Ni, J. (2023). Unveiling security, privacy, and ethical concerns of ChatGPT. *Journal of Information and Intelligence*.
<https://doi.org/10.1016/j.jiixd.2023.10.007>
- Zhao, W. X., Zhou, K., Li, J., Tang, T., Wang, X., Hou, Y., Min, Y., Zhang, B., Zhang, J., Dong, Z., Du, Y., Yang, C., Chen, Y., Chen, Z., Jiang, J., Ren, R., Li, Y., Tang, X., Liu, Z., . . . Wen, J. (2023, March 31). A survey of large language models. *arXiv*.
<https://doi.org/10.48550/arXiv.2303.18223>
- Zhou, J., Müller, H., Holzinger, A., & Chen, F. (2023). Ethical ChatGPT: Concerns, challenges, and commandments. *arXiv*.
<https://doi.org/10.48550/arxiv.2305.10646>
- Zhou, M., Chen, W., Zhu, S., Cai, T., Yu, J., & Dai, G. (2023). Application of large language models in professional fields. In *Proceedings of the 2023 11th International Conference on Information Systems and Computing Technology (ISCTech)* (pp. 142-146). IEEE.
<https://doi.org/10.1109/ISCTech60480.2023.00033>