

ARTIFICIAL INTELLIGENCE IN THE WORKPLACE: SKILLS TRANSFORMATION IN ENTERPRISES

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Abstract. The integration of Artificial intelligence (AI) technologies in enterprises inevitably faces various challenges, including technological, organizational, and workforce-related obstacles. This paper explores the concept and different types of AI, analyses the skills required for to design, develop, implement, and effectively use AI technologies and presents the results of a study. The study aims to assess the current state of AI technologies deployment in enterprises of Panevėžys region, with a particular focus on the importance of AI skills, analysing which AI skills are most lacking and how they can be developed in collaboration with higher education institutions.

Keywords: Artificial Intelligence technologies, AI skills, higher education

INTRODUCTION

In an era marked by rapid technological advancements, the integration of Artificial Intelligence (AI) has emerged as a transformative force across various sectors, fundamentally reshaping the way organizations operate and compete (Thilagavathy & Venkatasamy, 2023). The ongoing development of business and the most recent advances in AI allow for the many business practices to be improved by the capacity to establish new forms of collaboration, which is a significant competitive advantage (Jasmin et al., 2023).

The rapid advancement of AI technologies presents both opportunities and challenges for businesses worldwide (Aljaber & Almushaili, 2022). AI helps improve operational efficiency, drives innovation, and facilitates data-driven decision-making. As enterprises strive to remain competitive in the digital market, the successful integration of AI technologies becomes a key priority. However, this process is associated with various challenges, including technological, organizational, and workforce-related issues (Njeru, 2023). One of the most important aspects of this transformation is the need for skill development, as companies must ensure that their employees possess the necessary competencies to effectively manage and apply AI technologies.

This paper explores the concept and different types of AI, analyses the skills required for to design, develop, implement, and effectively use AI technologies and presents the results of a study. The study aims to assess the current state of AI technologies deployment in enterprises of Panevėžys region, with a particular focus on the importance of AI skills, analysing which AI skills are most lacking and how they can be developed in collaboration with higher education institutions.

The aim of the study is to explore how AI technologies transform enterprise skills, focusing on key employee skill gaps critical for successful AI implementation and management, as well as opportunities to bridge these gaps through collaboration with higher education institutions. The objectives of the research: 1. To present the concept and types of AI. 2. To perform AI skills analysis. 3. To discuss the results of a study.

Research methods: analysis of scientific literature, questionnaire.

The rest of this paper is structured as follows. Section 1 explores the concept and different types of AI. Section 2 analyses AI skills. Section 3 presents the methodology of the study. Section 4 presents the results of the conducted study. Finally, Section 5 presents the conclusions.

ARTIFICIAL INTELLIGENCE CONCEPT AND TYPES

Artificial intelligence (AI) refers to the interdisciplinary field that aims to replicate human cognitive abilities inside computational systems (Njeru, 2023). The pinnacle accomplishment within this domain would be the development of a computer capable of emulating or surpassing human cognitive capacities, including faculties such as logical deduction, comprehension, imaginative thinking, sensory perception, pattern recognition, inventive ideation, and affective responses. Although much progress has been made, we are still far from attaining this goal (Njeru, 2023). Nonetheless, notable accomplishments have been realized. Moreover, it is worth noting that the pursuit of these modest achievements in the field of AI has yielded a range of very valuable computational tools.

The primary objectives of AI focus on enhancing capabilities to automate routine tasks, analyze large datasets for informed decision-making, interact with users in a natural and intuitive way, and innovate in product and service development (Das, 2024). AI aims to extend and emulate human cognition, acting as a tool to magnify human expertise. AI is generally categorized into three types based on capabilities: Narrow AI (Weak AI), General AI (Strong AI), and Superintelligent AI (Amita, 2024).

Narrow AI (Weak AI): is a type of AI that is skilled of doing a definite duty intelligently (Amita, 2024). Narrow AI is the only type of AI currently achieved and involves systems designed for specific tasks, such as voice

assistants and facial recognition. Narrow AI appears intelligent but operates within strict constraints, performing predefined functions effectively (Aljaber & Almushaili, 2022).

Artificial General Intelligence (AGI) (Strong AI or Deep AI) represents a transformative milestone in the field of AI, characterized by the ability of a machine to perform any intellectual task that a human can (Joshi, 2024). This contrasts with Narrow AI, which excels in specific tasks but lacks general cognitive abilities. AGI aims to replicate human-like understanding and reasoning, though it remains unachieved.

Artificial Superintelligence (ASI): is a hypothetical stage of AI development where machines possess cognitive abilities far surpassing those of humans. ASI is characterized by superior intelligence, self-improvement capabilities, emotional intelligence, and autonomous decision-making (Zohuri, 2023). The advent of ASI would have profound implications across sectors, including scientific advancement, economic impact, and societal transformation.

The development of AGI and ASI presents significant risks that must not be ignored. The potential risks linked to AGI and ASI arise from their ability to exceed human intelligence and excel in a wide range of activities (Gulchenko, 2024). Responsible development and control are essential to harness ASI's potential while safeguarding humanity (Zohuri, 2023).

AI SKILLS: LITERATURE REVIEW

In Lithuania, the significance of AI skills is emphasized in the Lithuanian Artificial Intelligence Strategy (2019), which advocates for the development of AI competencies from primary education through vocational training and higher education study programs. The integration of AI systems into organizations highlights the critical need to identify and cultivate AI skills within the workforce (Morandini et al., 2023). AI skills refer to the knowledge and abilities required to design, develop, implement, and effectively use AI technologies (Celik et al., 2024). These skills encompass various fields and roles, enabling professionals to effectively apply, develop, and manage AI solutions. Researchers classify AI skills into two primary categories: general (soft) skills and specific (hard) skills. General skills, such as critical thinking, problem-solving, lifelong learning, ethics, creativity, communication, and collaboration, are essential for working effectively with AI systems (Morandini et al., 2023). These competencies enable employees to adapt to new technologies and processes while fostering continuous development in the face of rapidly evolving advancements (see Table 1).

Table 1. Description of general or soft AI skills

Skills	Description
Problem-Solving and Critical Thinking	The ability to select and implement appropriate AI solutions, analyze results, and make informed decisions.
Ethics	A strong understanding of the ethical considerations surrounding AI, including awareness of biases, societal impacts, and relevant regulatory frameworks.
Communication and Collaboration	The ability to effectively communicate complex AI concepts to non-technical stakeholders and collaborate successfully within interdisciplinary teams.
Lifelong learning	A commitment to staying current with the latest developments in AI research, tools, and practices, while demonstrating adaptability to emerging technologies and shifting trends.
Creativity	The capacity to leverage AI in the creation of innovative ideas and solutions.

Specific or hard skills encompass technical expertise crucial for navigating the technology-driven landscape (Babashahi et al., 2024). These include proficiency in data processing and management, machine learning, programming, robotics and automation, mathematical modeling, cybersecurity, and other technological specializations (Babashahi et al., 2024). Such skills are the foundation of AI integration, driving innovation and efficiency across industries (see Table 2).

Table 2. Description of specific or hard AI skills

Skills	Description
Data Processing and Management	Skills in handling large and complex datasets, ensuring that data is properly prepared and structured so that AI models can process, analyse and extract meaningful insights.
Machine Learning	Skills that include the design, implementation and optimisation of machine learning algorithms.
Programming	Coding skills in AI-specific programming languages for developing machine learning models, integrating AI systems into applications and products.
Robotics and Automation	Skills of developing and programming autonomous systems and robots, which involves integrating AI technologies with hardware. This includes understanding robotics algorithms, sensor integration, motion control, and the application of AI in automating complex tasks.
Mathematical Modeling	Skills to cover advanced mathematics and statistical models used in the field of AI, which are important for developing algorithms and analysing data structures in AI applications.
Cybersecurity	Skills include remediating vulnerabilities, ensuring data integrity and privacy, developing methods to protect AI applications from attack, ensuring secure data transfer and maintaining the security of AI-driven systems in the operating environment.

AI skills ensure that staff can use, design, and develop AI solutions. As AI evolves rapidly, organizations must find ways to ensure their employees possess sufficient AI skills, which is crucial for remaining competitive in an ever-changing AI landscape. A culture of continuous learning and upskilling is essential to keep pace with these advancements and fully realize AI's potential.

METHODOLOGY

Research Design. The study was conducted to explore the adoption of AI technologies in enterprises, focusing on the current state of AI deployment, the challenges organizations face during implementation, and giving particular attention to identifying the most lacking AI skills and how these can be developed in collaboration with higher education institutions.

The study was designed as a quantitative survey with questions divided into the following main groups: 1. Information about the respondents. 2. Impact of AI technologies on business operations. 3. The scope of AI technologies adoption and the main challenges. 4. AI skills lacking among employees in the implementation and application of AI solutions. 5. Strategy for AI skills development in enterprises. 6. Collaboration with higher education institutions to address skill shortages.

Data Collection: A structured online questionnaire was sent to 73 enterprises in the Panevėžys region to ensure a representative sample from various sectors. The selected enterprises were asked to have the questionnaire completed by several managers from different departments. A total of 55 companies responded, representing 75.3 percent of all companies surveyed. Notably, nearly half (49 percent) of the responding enterprises operate primarily in the manufacturing sector. The questionnaire was designed to be user-friendly, combining both closed and open-ended questions to collect comprehensive information.

Data analysis. The data collected were analyzed using descriptive statistics to summarize the main trends and patterns related to the issues analyzed. This analysis aimed to determine the level of AI implementation, the related challenges, identify the key AI skills most lacking among employees, and explore opportunities for their development. The results were structured and presented in tables and graphs to facilitate the visualization and interpretation of the findings. The use of these visual aids allowed for a better understanding of the distribution of responses and highlighted areas for further research.

Ethical aspects. Ethical standards were followed throughout the study to ensure the privacy and confidentiality of all participants. Respondents were assured that their participation was voluntary, and that their responses would be anonymized and used solely for the purposes of the research. The study results are presented only in summarized form to prevent the identification of individual respondents or companies, thereby maintaining the integrity of the data and protecting participant confidentiality.

RESULTS OF THE STUDY

The study aimed to examine the adoption of AI technologies in enterprises, with a particular focus on the challenges organizations face during the adoption process and the importance of skills development for the effective integration of AI into business operations. The research objectives:

1. To determine whether enterprises are familiar with AI technologies and how they evaluate their importance for business operations.
2. To identify the scope of AI technologies adoption in enterprises and the main challenges they face in implementing AI in their business operations.
3. To identify the most essential AI skills that employees lack the most when applying, developing, and implementing AI technologies in enterprises.
4. To assess the strategic readiness of enterprises to develop the necessary skills, and identify key forms for collaboration with higher education institutions to strengthen employees' AI skills.

A total of 55 enterprises from the Panevėžys region completed the questionnaire. Of these, 18 percent were large enterprises, 44 percent were medium-sized enterprises, and 38 percent were small enterprises.

The study found that all the surveyed enterprises are aware of AI technologies. Respondents emphasized that AI technologies increase productivity (91 percent), make employees' jobs easier (82 percent), encourage employees to acquire new skills (87 percent), and reduce the number of jobs (64 percent) (see Table 3). Only 9 percent of respondents did not perceive any impact of AI technologies on their enterprise's operations. The results of the study show that most of the surveyed enterprises recognize the importance and impact of AI technologies on their operations and see their potential to improve operational efficiency and employee well-being. However, it is also worth noting that a significant proportion of respondents (64 percent) foresee a potential negative impact on the number of jobs, which may pose challenges for the labour market.

Table 3. The impact of AI technologies on business operations

No	The impact of AI technologies on business operations	Number of enterprises in percent
1.	Labour productivity is increasing	91
2.	Fewer jobs	64
3.	Ease of work for employees	82
4.	Tensions within the company increase	27
5.	Employees need to acquire new competences	87
6.	No changes	9

The study found that 38 percent of the surveyed enterprises use AI technologies in their operations, indicating a strong interest in utilizing them to improve business processes and decision-making capabilities (see Figure 1). Seven percent of enterprises not only use AI technologies but also develop them, becoming leaders in innovation. However, the majority of the surveyed companies - 55 percent - reported that they neither use nor develop AI technologies, citing insufficient employee skills (87 percent), lack of resources (82 percent), and fear of facing new challenges (64 percent) as the main reasons. This further emphasizes the need for education and support to create favourable conditions for the broader adoption and development of AI technologies across all enterprises.

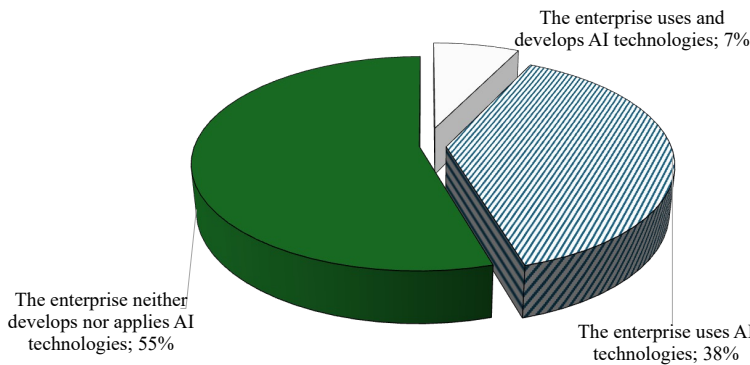


Figure 1. AI technologies adoption in enterprises

The study showed that, according to the surveyed enterprises, the most important general or soft AI skills required for applying and developing AI technologies are critical thinking (91 percent), lifelong learning (89 percent), problem-solving (85 percent), and communication and collaboration (73 percent) (see Figure 2). The surveyed companies emphasized that these are the skills their employees lack the most when applying, developing, or implementing AI solutions. Critical thinking is one of the most important skills, enabling specialists to analyse complex problems, evaluate options, and make sound decisions in the field of AI application and development. Lifelong learning is equally crucial, as it reflects the rapidly evolving nature of AI technologies, requiring continuous adaptation and knowledge acquisition. Problem-solving complements these skills by empowering employees to identify, assess, and address challenges that arise during the development or implementation of AI solutions. Similarly, communication and collaboration are essential for fostering teamwork and ensuring the seamless integration of AI solutions across various departments, facilitating a coordinated and effective approach to AI-driven transformation.

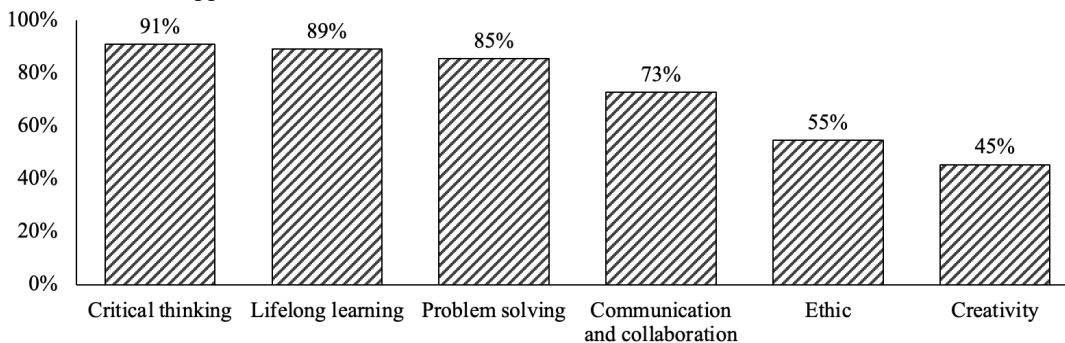


Figure 2. The most important general or soft AI skills in enterprises

As the most important specific or hard AI skills, the surveyed enterprises highlighted machine learning (91 percent), data processing and management (85 percent), cybersecurity (73 percent), and programming (51 percent) (see Figure 3). Regarding specific or hard AI skills, data processing and management are especially important, as they enable handling large volumes of data that serve as the foundation for AI models, ensuring their accuracy and relevance. Machine learning emphasizes the need for knowledge in developing and improving algorithms that enhance AI performance over time. Cybersecurity has emerged as a critical skill, especially as AI solutions become increasingly integrated into business operations. As AI systems handle sensitive data and are often connected to broader digital infrastructures, ensuring the

security of these systems is paramount. Cybersecurity skills are vital for protecting AI systems from vulnerabilities, preventing data breaches, and ensuring the safe and ethical use of AI technologies. These skills also play a key role in safeguarding organizational assets and maintaining trust with clients and stakeholders in an AI-driven environment. Given the rapid advancement of AI, the demand for cybersecurity expertise is expected to grow, making it a crucial skill for any AI-focused workforce. Programming skills are essential for implementing AI solutions and adapting them to specific business needs.

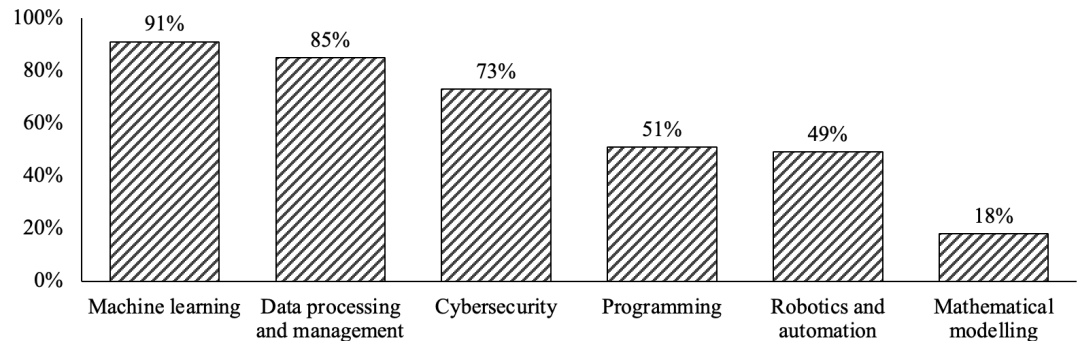


Figure 3. The most important specific or hard AI skills in enterprises

Although 91 percent of the surveyed enterprises believe that AI technologies enhance labour productivity, and 87 percent of enterprises not using AI technologies in their operations identified a lack of employee competencies as a key challenge for AI integration, 64 percent of all participating enterprises reported not having a dedicated strategy to develop AI skills (see Figure 4). This discrepancy underscores a significant gap between acknowledging the potential benefits of AI technologies and taking practical steps to implement these technologies and build the necessary skills within organizations.

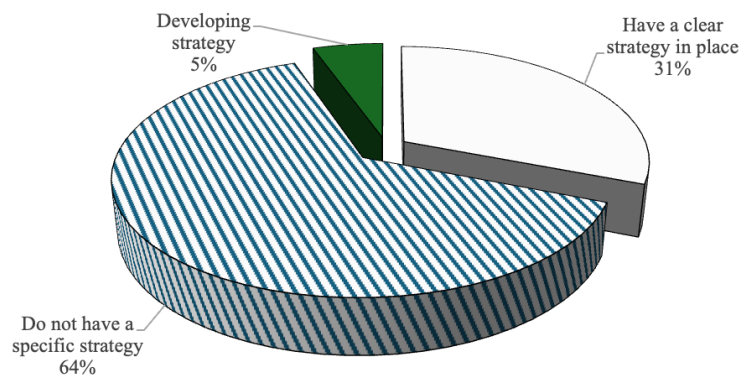


Figure 4. Strategy for AI skills development in enterprises

The surveyed enterprises indicated various forms of collaboration with higher education institutions in the development of AI skills: collaboration in the development of new study programs and the process of updating existing content (91 percent), organizing joint seminars for AI skills development (93 percent), collaboration in the development of instructional materials on the topic of AI skills development (82 percent), and providing students with internship opportunities in a enterprise to acquaint them with the significance of AI skills in specific workplaces (38 percent) (see Table 3). The collaboration between enterprises and higher education institutions is instrumental in developing a workforce that is well-equipped with the necessary AI skills, driving innovation and competitiveness in the industry. Continued partnership and investment in these collaborative initiatives will be vital for sustaining the growth and integration of AI technologies in various sectors.

Table 3. Collaboration with higher education institutions in developing AI skills

No	Types of collaboration	Number of enterprises in percent
1.	Collaboration in the development of new study programmes and the process of updating existing content	91
2.	Collaboration in the development of instructional materials on the topic of AI skills development	82
3.	Organizing joint seminars for AI skills development	93
4.	Providing students with internship opportunities in a company to acquaint them with the significance of AI skills in specific workplaces	38
5.	Collaboration in formulating topics for students' final projects and semester assignments related to the relevance of AI skills	36

6.	Conducting joint scientific research on the topic of AI transformation	18
7.	Contributing to the development and implementation of informal education programs related to AI skills development	33

In the Panevėžys region, a study involving 55 companies of varying sizes found that while most companies recognize the productivity and operational benefits of AI technologies, a significant portion lacks a strategic approach to developing the necessary skills, underscoring the need for enhanced collaboration with higher education institutions to address these skill gaps and ensure sustained competitiveness and innovation in the evolving technological landscape.

CONCLUSIONS

Artificial Intelligence (AI) seeks to replicate human cognitive abilities within computational systems. It is typically categorized into three types based on its capabilities: Narrow AI (Weak AI), General AI (Strong AI), and Superintelligent AI.

In the scientific literature, AI skills are defined as the knowledge and abilities required to design, develop, implement, and effectively utilize AI technologies. Researchers divide AI skills into two categories: general (soft) skills and specific (hard) skills. General AI skills include critical thinking, problem-solving, lifelong learning, ethics, creativity, communication, and collaboration. Specific or hard AI skills encompass proficiency in data processing and management, machine learning, programming, robotics and automation, mathematical modelling, and cybersecurity.

The conducted study revealed that enterprises in the Panevėžys region recognize the value of AI in enhancing productivity and efficiency. They identify a lack of employee skills as one of the major challenges hindering the effective adoption and use of AI technologies. Despite this, only a small number of enterprises have developed strategies for fostering AI skills. The most important AI skills include critical thinking, lifelong learning, problem solving, communication and collaboration, machine learning, data processing and management, as well as cybersecurity. To improve these skills, special attention should be given to collaboration with higher education institutions. Enterprises highlighted key forms of collaboration, such as developing new study programs, updating existing curricula, organizing joint seminars, and creating educational materials focused on advancing AI skills.

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