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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE DEVELOPMENT OF THE INDUSTRY 5.0 AND NEW COMPETENCES FOR THE 21ST CENTURY

Abstract

Industry 5.0 is an area of intensive technological development, with particular emphasis on artificial intelligence (AI), as well as the Internet of Things (IoT), robotics and process automation (RPA), big data analytics, and cyber-physical systems (CPS). The collaboration between humans and artificial intelligence, which plays a key role in transforming workplaces, has started to determine the development and success of companies. Ensuring the company's success requires commitment to training processes and improving the digital skills of employees. The research problem lies in adequately preparing people for the new career opportunities created by the advancement of digital technologies. The aim of this paper is to identify key competencies and innovative training programs that, in collaboration with artificial intelligence, can support the more effective utilization of employees' intellectual potential and knowledge. The article proposes the hypothesis that the implementation of artificial intelligence within Industry 5.0 will contribute to the restructuring of the labor market, leading to the replacement of traditional jobs with new, highly specialized positions that will require decision-making skills, creativity, and advanced specialist knowledge. The research methodology used includes a critical analysis of relevant literature and market data, as well as case studies. Amazon and Siemens were selected as case studies to gain detailed insight into organizing effective collaboration between machines and humans, additionally supported by professional training that develops the digital competences of employees. The analysis identified crucial competencies and career opportunities that are becoming essential in the evolving concept of Industry 5.0, focused on human collaboration with intelligent machines, as well as Industry 6.0, which is still in the conceptual phase and may include further integration of technologies such as more advanced forms of artificial intelligence and production autonomy.

Keywords: modern technologies, industry 5.0, digital competences, automation and robotization of workplaces.



WPLYW SZTUCZNEJ INTELIGENCJI NA ROZWÓJ PRZEMYSŁU 5.0 ORAZ NOWYCH KOMPETENCJI XXI WIEKU

Streszczenie

Przemysł 5.0 to obszar intensywnego rozwoju technologicznego, ze szczególnym uwzględnieniem sztucznej inteligencji (SI), ale także Internetu Rzeczy (IoT), robotyki i automatyzacji procesów (RPA), analizy dużych zbiorów danych (Big Data) oraz systemów cyber-fizycznych (CPS). Współpraca ludzi ze sztuczną inteligencją, która odgrywa kluczową rolę w transformacji miejsc pracy, zaczęła warunkować rozwój oraz sukces firmy. Zapewnienie sukcesu firmy wymaga jednocześnie zaangażowania w procesy szkoleniowe i podnoszenia kwalifikacji cyfrowych pracowników. Problem badawczy polega na odpowiednim przygotowaniu ludzi do nowych możliwości zawodowych, stworzonych przez rozwój technologii cyfrowych. Celem niniejszego artykułu jest identyfikacja kluczowych kompetencji oraz innowacyjnych programów szkoleniowych, które we współpracy ze sztuczną inteligencją mogą wspierać efektywne wykorzystanie potencjału intelektualnego i wiedzy pracowników. W artykule postawiono hipotezę, zgodnie z którą wdrożenie sztucznej inteligencji w ramach Przemysłu 5.0 przyczyni się do restrukturyzacji rynku pracy, prowadząc do zastępowania tradycyjnych miejsc pracy nowymi, wysoko wyspecjalizowanymi stanowiskami, które będą wymagały umiejętności decyzyjnych, kreatywności oraz zaawansowanej wiedzy specjalistycznej. Zastosowana metodologia badawcza obejmuje krytyczną analizę literatury przedmiotu i danych rynkowych, a także studium przypadków. Jako studium przypadków wybrane zostały Amazon i Siemens, aby uzyskać szczegółowy wgląd w organizowanie efektywnej współpracy maszyn i ludzi, wspieranej dodatkowo przez szkolenia zawodowe, rozwijające kompetencje cyfrowe pracowników. W wyniku przeprowadzonej analizy zidentyfikowano kompetencje i możliwości kariery, które stają się niezbędne w ewoluującej koncepcji Przemysłu 5.0, koncentrującego się na współpracy człowieka z inteligentnymi maszynami, a także Przemysłu 6.0, który jest wciąż w fazie koncepcyjnej i może obejmować dalszą integrację technologii, takich jak bardziej zaawansowane formy sztucznej inteligencji i autonomii procesów produkcyjnych.

Słowa kluczowe: nowoczesne technologie, przemysł 5.0, kompetencje cyfrowe, automatyzacja i robotyzacja miejsc pracy.

Introduction

The development and adaptation of digital technologies in enterprises, particularly artificial intelligence, determine a company's success in Industry 4.0, while simultaneously transforming job positions. The automation and robotization of production processes increase the demand for the intellectual potential and specialized knowledge of employees, enabling effective collaboration between humans and artificial intelligence. As a result, new career opportunities are

emerging. However, to take advantage of these opportunities, appropriate competencies are required. The research problem focuses on adequately preparing employees for the new career opportunities created by the development of digital technologies. The aim of the article is to identify key competencies and innovative training programs that, in collaboration with artificial intelligence, can support the effective utilization of employees' intellectual potential and knowledge. A critical analysis of the relevant literature, market data, and a case studies served as research methods in addressing the research problem. The selection of Amazon and Siemens as case studies provided detailed insights into the effective cooperation of machines and humans, supported by professional training that develops the digital competences of employees. According to the authors, the identified competencies are not only part of the developing concept of Industry 5.0, which focuses on the cooperation of humans with intelligent machines, but also of Industry 6.0, which is still in the conceptual phase and may include further integration of technologies such as more advanced forms of artificial intelligence and autonomy of production processes.

It is appropriate to ask the following questions. What role do intelligent and autonomous systems, based on AI, IoT, Big Data, 3D printing, and extended reality (XR), which encompasses all immersive technologies that merge physical and virtual reality, play in Industry 5.0? How can humans effectively collaborate with them? What competencies are required by the 21st-century labor market, supported by the digitization and automation of workplaces? The authors will attempt to address these questions in this article.

The rest of the article is organized as follows. Section I characterizes the concept, characteristics, and challenges of Industry 5.0. It also presents the role of intelligent and autonomous technologies in Industry 5.0, based on AI, IoT, Big Data, 3D printing, and augmented reality (XR). Section II presents selected applications of AI in Industry 5.0, with a special focus on Amazon's solutions. Section III identifies new professional opportunities and crucial competencies that enable effective cooperation between people and digital technologies of the 21st century. In addition, the authors point to the important role of the education system as well as entrepreneurs in developing qualifications and conducting professional training, using Siemens as an example. Finally, conclusions and recommendations for the development of digital competencies required in Industry 5.0 and 6.0 are presented.

1. Concept, features and challenges of Industry 5.0

Characterizing Industry 5.0 requires interpreting the contribution that Industry 4.0 has made to economic development. The concept of Industry 4.0 is defined as an idea, a concept, a new business philosophy, and even as the fourth industrial revolution¹. Unlike previous industrial revolutions, it is not limited solely

¹ Moczyłowska J.M., *Industry 4.0 (?) People and Technology*, Difin, Warsaw 2023, pp. 9–10 (in Polish).

to product manufacturing methodologies. To understand the origins of Industry 4.0, it is essential to briefly mention the previous industrial revolutions. The first industrial revolution began in England at the end of the 18th century with the invention of the steam engine and the mechanization of the textile industry. During this time, traditional crafts and manual labor gave way to mechanisms powered by water and steam. The second industrial revolution occurred in Europe and the United States at the end of the 19th century and was associated with the implementation of mass production, as well as the replacement of steam power with chemical energy and electricity². As early as the mid-20th century, the development of the first computers heralded the arrival of the third industrial revolution, based on the use of IT solutions in industry and the advancement of information and communication technologies (ICT). The third industrial revolution, which began in the western United States and Japan, introduced computer systems, semiconductors, and the Internet. In response to the growing demand for products, automated assembly lines were implemented in production, significantly increasing productivity and setting new standards for efficiency.

The fourth technological (digital) revolution, in which Industry 4.0, Enterprise 4.0, and Business 4.0 are developing, focuses on using digital technologies to enhance a company's ability to create new, digital business models. It represents a further step forward, as this revolution encompasses not only the methodology of product manufacturing but also the ways in which products are distributed, stored, and how customers communicate with businesses. Technologies that intensify the fourth technological revolution include AI, IoT, and Big Data, as they provide vast potential for diverse data processing capabilities³. Artificial Intelligence (AI) is not merely a continuation of the status quo at a higher technological level, but a game changer in virtually all areas of economic activity. AI redefines business operations in a completely new way, creating new opportunities for profit generation that were unavailable in the analog economy.

The current phase of digitalization in the industrial sector opens up new opportunities for manufacturers to develop, implement, and efficiently utilize advanced production systems. Examples include highly configurable production lines, applied across various sectors. Importantly, this digital transformation allows industrialists to implement mass production in shorter timeframes and at lower costs, without compromising the quality of the goods produced. These

² Ślusarczyk B., *Industry 4.0 – Are we ready?*, <https://pjms.zim.pcz.pl/resources/html/article/details?id=174938&language=en>, [access:30.06.2018].

³ Balicki J., Balicka H., Dryja P., Tyszkla M., *Big data and the internet of things in edge computing for smart city*, [In:] Saeed K., Chaki R., Janev V. (eds), *Computer Information Systems and Industrial Management*, CISIM 2019. "Lecture Notes in Computer Science" 2019, Vol. 11703, Springer, Cham, pp. 99–109, <https://doi.org/10.1007/978-3-030-28957-7>.

technological advancements represent a significant step towards more efficient and flexible production, meeting the growing demand for product personalization in line with individual customer preferences.

While Industry 4.0 is associated with the acceleration of technologies primarily based on AI, the foundation of Industry 5.0's development lies in the effective collaboration between humans and digital technologies. It is important to note that Industry 5.0 encompasses not only the manufacturing sector but also trade, services, and research and development processes⁴. Alongside the development of the Industry 5.0 concept, the idea of Society 5.0 is also emerging – a society capable of harnessing its intellectual potential in effective collaboration with modern technologies while respecting the natural environment. The latest advancements in AI, the IoT, and Robotic Process Automation (RPA) align with the Industry 5.0 concept by:

- implementing solutions focused on effective human-machine interaction, leveraging the strengths of both humans and machines;
- intelligent technologies inspired by biology that enable the creation of materials with embedded sensors and enhanced functions, as well as being suitable for recycling;
- digital twins in real time and simulations for modeling systems;
- cybersecurity technologies for the transmission, storage, and analysis of data that can handle data and system interactions;
- technologies for energy efficiency and reliable autonomy.

Technologies that enhance the development not only of Industry 4.0 but also of Industry 5.0 improve human work by increasing its efficiency, reliability, quality, and safety, while also helping to reduce costs. Furthermore, the ability to process large datasets (Big Data) in a short time facilitates quick and effective decision-making⁵. Transformation 5.0 is entering people's daily lives much more significantly than transformation 4.0 did. Advances in information technology, IoT, robotics, and artificial intelligence are actively used in everyday life, not only to facilitate work in industry or healthcare but also for the convenience and benefits of every citizen in their daily activities⁶.

In the revolutionary era of Industry 5.0 development, the production environment is undergoing a profound transformation, increasing production scale, achieving sustainable environmental efficiency, and improving quality of life. Computers, machines, and human interactions are interconnected to create a cohesive system, resulting in a more efficient and integrated production envi-

⁴ European Commission, *Enabling Technologies for Industry 5.0*, Brussels September 2020, pp. 10–13.

⁵ Balicka H., *Digital technologies in the accounting information system supporting decision-making processes*, "Scientific Papers of Silesian University of Technology – Organization and Management Series" 2023, No. 169, pp. 57–89, <http://dx.doi.org/10.29119/1641-3466.2023.169.4>.

⁶ European Commission, *Industry 5.0*, Brussels January 2021, pp. 5–15.

ronment⁷. Revolutionary changes in factory structures, where machines become intelligent and autonomous systems, are driven by technologies such as AI, IoT, Big Data, 3D printing, and extended reality (XR), which encompasses all immersive technologies that blend the physical and virtual realities, including virtual reality (VR) and augmented reality (AR). In the following sections, the authors of the article will attempt to answer the question of what role systems based on these technologies play in factories and what competencies they require from the people working with them.

The introduction of IoT enables machines to communicate in real time, optimizing processes and quickly responding to changing production demands. 3D printing opens new possibilities for design and manufacturing, enhancing the flexibility of creating complex components, efficiently utilizing resources, and minimizing waste. Meanwhile, AI and machine learning, through the analysis of large datasets in relatively short time frames, allow for the prediction of potential failures and enable quick autonomous decision-making, thereby increasing efficiency and reducing the risk of errors. Big Data is used to generate valuable insights and precise forecasts, strengthening the ability to make informed business decisions. Additionally, XR, by integrating the physical world with the virtual one, facilitates employee training and streamlines production processes.

Along with the conveniences brought by the latest advancements in digital technology, challenges also arise that require effective management strategies. Key issues faced by entrepreneurs include cybersecurity, technophobia, the need for developing new digital skills, and financial concerns. In the context of Industry 5.0, cybersecurity becomes an essential element that determines the successful implementation of modern technologies in the production environment. The phenomenon of increased connectivity among devices and systems creates potential threats to production infrastructure. As the number of devices connected to the network grows, a complex communication system emerges that can be vulnerable to various types of cyber threats. Attacks may aim to disrupt production processes, steal confidential industrial data, or even sabotage control systems. Therefore, identifying potential vulnerabilities in systems, whether related to software or hardware, becomes a priority. Implementing multi-factor authentication and regularly updating software are key measures that can significantly enhance system resilience against attacks. Effectively securing industrial infrastructure against cyberattacks requires continuous adjustment of strategies to the evolving cybersecurity landscape. As a result, companies are increasingly seeking specialized cybersecurity developers, leading to a growing demand for such positions.

⁷ Aoun A., Ilinca A., Ghandour M., Ibrahim H., *A review of Industry 4.0 characteristics and challenges, with potential improvements using blockchain technology*, "Computers & Industrial Engineering" 2021, vol. 162. <https://www.sciencedirect.com/science/article/abs/pii/S0360835221006501/>, [access: 11.10.2021].

The implementation of Industry 5.0 requires the involvement of a highly skilled workforce with competencies suitable for collaborating with modern digital technologies. The better qualified the staff, the easier and quicker it is to implement changes. A lack of appropriate digital skills leads to increased technophobia, manifesting as reluctance to change, resistance, and even fear of losing privacy or being replaced by machines in the workplace. The concerns of those affected by technophobia often stem from a lack of understanding of how technologies work. Therefore, it is crucial to analyze the skill levels of employees and develop effective training programs that are essential for successfully adapting to the new industrial reality.

Financing new solutions is another challenge associated with the implementation of Industry 5.0 technologies, as investments in modern technologies such as AI and IoT can be a significant burden, especially for small and medium-sized enterprises. Entrepreneurs are therefore developing strategies that consider a variety of financial resources. Public grants, EU structural funds, and specialized government programs are important sources of funding for innovative ventures. Collaboration with industry partners, technology providers, and financial institutions plays a crucial role in facilitating access to capital.

2. AI applications in Industry 5.0

Amazon has many warehouses around the world that are equipped with robots. They show that it is possible to collaborate with robots without worrying that people's jobs will be replaced by modern technology. Amazon's warehouse in Gliwice is a good example. However, already at the heart of robotics, machines are realizing their potential. An example is the BOS27 robotics center in Westborough, Massachusetts.

The warehouse has 3900 robots, which will be responsible for picking orders and stacking products on the shelves. The number of employees in 2021 was 2,000. Their job is to properly pack the goods and check the goods for damage. The warehouse itself has four floors and its area is as much as 210 thousand square meters. Collaborating with robots streamlines many processes that used to take more time as humans performed them. What is more, robots are also able to move heavy objects without any "effort". The equipment itself is based on the Kivia system, which Amazon Robotics acquired in 2012. The machines are equipped with sensors, so they do not collide with each other. Also, they can load themselves by pulling up to the loaders, so workers do not have to worry about the machine stopping with the goods. The system itself in the warehouse is cloud-based. Even employees are able to see where the robot is at any given time, as they scan QR codes that are on the floor. Collisions with humans are

also impossible, thanks to a special Robotic Tech Vest that each employee must wear so that the robots can, "see" people⁸.

Moving on to the robotics center, there the machines are manufactured. In the centers themselves, there are diverse types of robots. The robots are so technologically advanced that already at the stage of assembling them, they drive themselves onto pallets and further parts are assembled. Finally, at the end, they drive themselves to the place where they are to be packed and transported to logistics centers around the world. Some are stationary robots with an arm that are responsible for sorting packages of products. Others look like a Roomba and are responsible for transporting shelves. Amazon does not stop with these few types of robots and is constantly designing new ones. The rack-carrying robots are not allowed to collaborate with humans, although Amazon wants to release robots of the same type to work among humans. The machines that work in the robotics center have a slightly different system, as they scan their surroundings and mark their presence with a green laser, while those robots that collaborate with humans scan a QR code. Amazon denies the information in connection with replacing humans with robots. Each trainee goes through a 12-week training program in the area of mechatronics and knitting, but in addition must complete 2,000 hours of on-the-job training. The culmination of the knowledge gained is the receipt of a certificate confirming the skills. The robots themselves, according to Amazon, increase the safety level of workers and cushion them from lifting the heaviest parcels and moving them from place to place, but do not fully replace their work⁹.

The idea of Industry 5.0 has already entered many workplaces, as it is also based on technologies from the fourth industrial revolution, but in this one human have the upper hand. Machines are to support workers, not replace them, which is the main reason why Industry 5.0 is gaining more and more acceptance. We cannot call Industry 5.0 another revolution, but rather a correction of the previous revolution¹⁰. That's why it is hard to point out specifically something that would only be characteristic of Industry 5.0.

The figure 1 shows how the idea of Industry 5.0 has been improved, it can be seen that this time it can be said that man is above the machine, not the machine above him. For many people, this can be a really good , "improvement", as

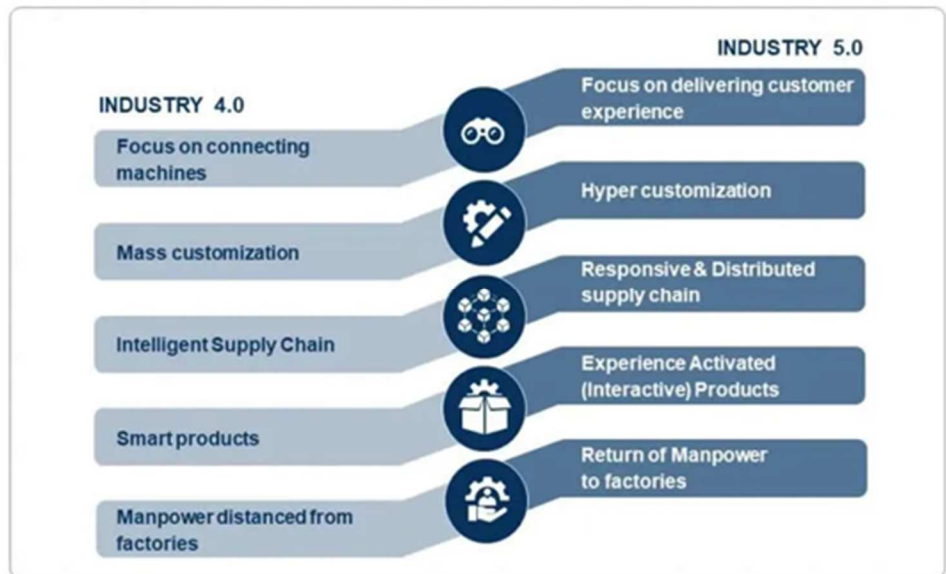
⁸ Team Amazon, *Get to work, robots! See how Amazon's robotic center works*, <https://www.aboutamazon.pl/wiadomosci/miejsca-pracy-i-inwestycje/do-roboty-roboty-zobaczcie-jak-dziala-robotyczne-centrum-amazon>, [access: 02.10.2023] (in Polish).

⁹ Garbiec P, *They shoot lasers, pack themselves and there are half a million of them. We have seen Amazon's robot armies*, <https://spidersweb.pl/2022/11/amazon-roboty-centrum-logistyczne-proteus-sparrow-dron-prime-air.html>, [access: 29.11.2022] (in Polish).

¹⁰ I-scoop, *Industry 5.0 – the essence and reasons why it gets more attention*, <https://www.i-scoop.eu/industry-4-0/industry-5-0/>, [access: 25.06.2024].

many workers feared losing their jobs or problems in getting training. Despite the high prevalence of technology in the 4.0 transformation, new jobs were being created, but there was a lot of reluctance among the public for these changes, so perhaps now these changes will be , “warmer” welcomed by people.

Fig. 1. Difference between Industry 4.0 and Industry 5.0



Source: I-scoop, *Industry 5.0 – the essence and reasons why it gets more attention*, <https://www.i-scoop.eu/industry-4-0/industry-5-0/>, [access: 25.06.2024].

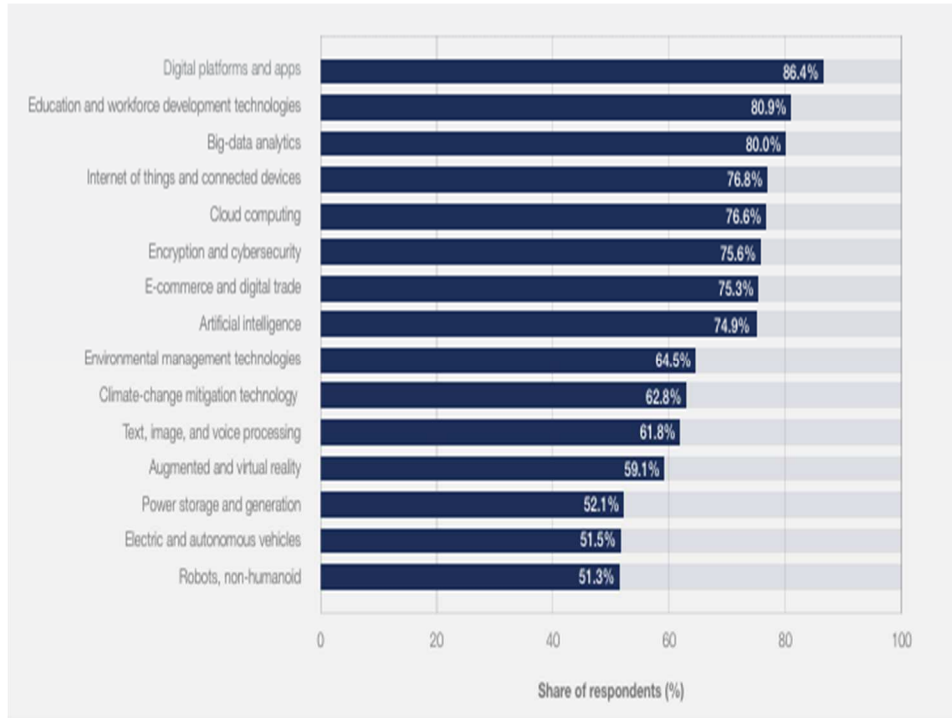
Amazon is defying common stereotypes that assume robots are a potential threat to humans and their jobs. On the contrary, the company is proving that technology can be an ideal partner for humans at work, thereby contributing to the development and improvement of employment conditions. One example in this approach is Amazon's initiative to support employees in acquiring new skills. Acquiring such skills allows them to get better paying jobs. As a result, Amazon provides an inspiring example of how to effectively use technology to support and develop human potential, thus demonstrating that technology is not as bad as those who don't understand it claim. That's why it's so important to enhance digital competencies and adapt education to the requirements of the industry 4.0 and 5.0. Vocational training promoting effective collaboration with modern technologies, with a particular focus on AI, is also crucial.

The latest technological advancements, especially in the fields of AI, IoT, Big Data, and Cloud Computing, provide companies with limitless opportunities for acquiring, collecting, and processing vast amounts of data in real time, from which essen-

tial information can be derived to make quick yet informed decisions¹¹. This enables accurate predictions of specific events. Additionally, it allows for advanced simulations that streamline the testing processes for new solutions. The reliability and precision of solutions in Industry 5.0 are also made possible by machines' ability to learn autonomously. Technologies in Industry 5.0 are biologically inspired as well. Examples include recognizing human intentions based on speech and gestures, as well as monitoring stress levels in employees. They also enhance physical capabilities, for instance, through exoskeletons. This transformation is connected to processes such as self-regeneration and self-repair, as well as the high adaptability of innovative technologies.

Figure 2 illustrates companies' interest in implementing technologies that enhance Industry 5.0 from 2023 to 2027. Changes in businesses during the era of digital economy development are inevitable. Therefore, it is particularly important to systematically adapt digital technologies to maintain operational continuity. A factor that undoubtedly accelerated the adaptation of digital technologies was the COVID-19 pandemic. The necessity of transitioning to remote work force employers to automate many processes at an accelerated pace.

Fig. 2. Technology adoption, 2023–2027



Source: World Economic Forum, *Future of Jobs Report*, Germany, 2023 p. 24.

¹¹ Balicka H., *Cloud computing and selected models of deep learning in banking*, "Space, Economy, Society" 2019, No. 16, pp. 57–88.

Automation plays a key role in industry, where robots are widely used to streamline production processes. This allows tasks to be performed with greater precision, leading to increased production efficiency and reduced costs. Precision is especially important in medicine, which is why their use is becoming more frequent in this field. In the transportation sector, autonomous robots are being introduced to enable more efficient and safer deliveries. Meanwhile, in services and customer support, robots can be found as bank advisors, in courier companies, or as assistants in online stores.

A good example of changes not only in human work but also in creating new job opportunities through automation is platform work. Automation has helped creative individuals establish and grow virtual businesses based on an open service model. New applications are systematically emerging in the market that perform various functions, including organizing food deliveries like Glovo and Wolt, facilitating passenger transport services like Bolt and Uber, streamlining property rentals like Airbnb, and providing real-time navigation and integration of transport options like Here WeGo and CityMapper. In this way, companies are moving away from traditional team-based models, as they can more quickly and easily find individuals for specific tasks, allowing people from all over the world to join these platforms.

Most advanced technologies consume large amounts of energy. Therefore, integrating them with renewable energy sources is crucial, including the incorporation of hydrogen technologies and Power-to-X, which are implemented to balance emissions¹². The implementation of innovative solutions based on technologies enhancing Industry 5.0 also requires specialized skills. As a result, new professions are emerging, including roles such as Big Data Analyst, Big Data Scientist, and Big Data Architect, which are crucial for effectively managing innovative areas of collaboration between humans and machines.

3. New professional opportunities and crucial competencies on the market in the 21st century

3.1. New professional opportunities

The introduction of recent technologies arouses many emotions ranging from excitement to apprehension. The use of artificial intelligence is causing changes in the workforce structure, as recent technologies are being used at many stages of production, which require corresponding competencies. Because of this, so-called technological unemployment is being created. The disappearance of professions itself is not so terrible, on the contrary, it is called creative destruction, which involves replacing the old with the new. New employment patterns are emerging. This works in such a way that innovation creates jobs in other sectors, especially in knowledge-based sectors. A report by the Institute for the

¹² European Commission, *Enabling Technologies for Industry 5.0*, Brussels September 2020, pp. 7–9.

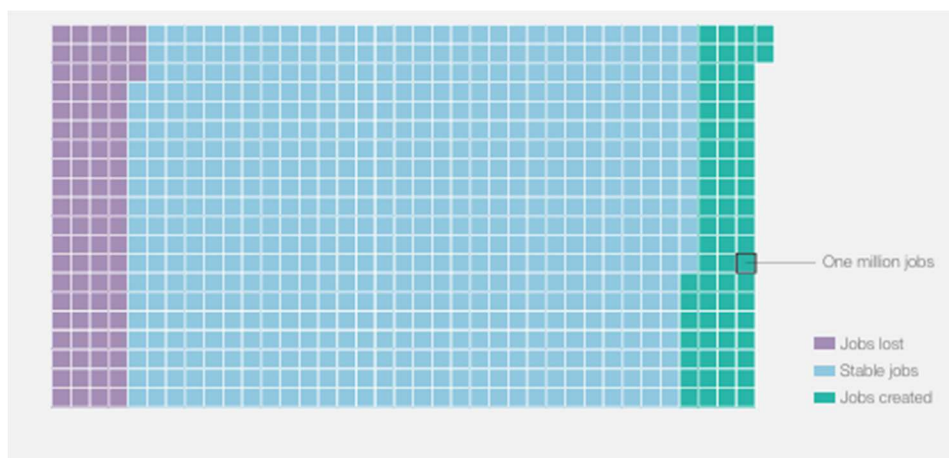
Future (ITTF) estimated that about 85% of jobs have yet to be invented. These are occupations that should emerge by 2030, according to the report. The professions that have already emerged would have been unthinkable a few years ago, and now they are on the order of the day. Innovation does not necessarily destroy a profession, a perfect example of this is e-mail, which nevertheless has not eliminated traditional mail and is still used quite often, although it does change the way people work. Some professions are aging, but new ones are being created in places affected by the recent technologies being introduced. Below, the Authors lists some new professions, created by the introduction of innovative technologies and AI:

- AI engineer – is a specialist in the creation, development, and implementation of AI systems;
- IoT engineer – designs, implements, and manages systems made up of devices that communicate with each other via the Internet;
- blockchain developer – this person develops and maintains applications based on blockchain technology.

The UK has seen an increase in information technology managers by 6.5 times to more than 327,000 in recent decades. The same is true for programmers and software development specialists, whose numbers have tripled. Another good example of the development of the economy through the introduction of modern technologies is Brazil, which has specifically accelerated the pace of technological progress in order to increase the number of employees. The result has been positive, as the number of formally registered Brazilians has increased by 25.8 million in two decades¹³. People who have lost their jobs due to automation will be able to find employment where new jobs have been created with the investment of resources saved by mechanizing the process. In figure 3, it is possible see a large loss of occupations that may cease to exist, but at the same time about fifty million new professions are being created. However, a sizable portion of occupations are stable.

¹³ Vilbert J., *Technology creates more jobs than it destroys*, <https://fee.org/articles/technology-creates-more-jobs-than-it-destroys/>, [access: 10.09.2019].

Fig. 3. Projected job lost and created, 2023–2027



Source: World Economic Forum, *Future of Jobs Report*, Germany, 2023 p. 38.

The use of modern technologies and artificial intelligence should not make people reluctant to learn or fear losing their jobs, on the contrary. These innovations should drive humans to continually develop and improve their skills. Artificial intelligence, which is often perceived as the enemy of man, can support efforts, and facilitate the performance of many tasks. However, it is worth remembering that, despite everything, technology is fallible and has its flaws, and errors, and does not have the qualities that humans have. In many situations, an algorithm will not help solve a situation only intuition. The aforementioned "human aspect" of work combines a variety of skills, including empathy, persuasion, communication problem-solving and decision-making¹⁴. Machines are ideal for interpreting numbers and algorithms. Therefore, ultimately, instead of fearing change, it is worth looking at innovative technologies and artificial intelligence as tools that can support humans by streamlining work and improving quality of life.

Cooperation between man and machine can create new jobs but can also positively influence the development of the environment and improve life in cities, for example. As early as the 1990s, many people invested heavily in companies tasked with minimizing environmental degradation in order to balance the urban environment. Examples include monitoring drinking water or detecting chemical leaks. It is also important to control pressure changes in plumbing systems as well as check the quality of water in swimming pools. Already, water scarcity covers about 40% of the world's population, and this is not going to improve anytime soon. One of the innovative solutions to this problem is the use of IoT, as well as deep learning, which makes it possible to conduct tasks to

¹⁴ Su Z., Togay G., Cote A-M., *Artificial intelligence: a destructive and yet creative force in the skilled labour market*, "Human Resource Development International", United Kingdom, June 2021, Vol. 24, pp. 346–349.

counteract the worsening problem of water scarcity and reduce the negative effects. The task of the Internet of Things in this case is to monitor the quality of rivers, lakes, coastal and groundwater. It also assists in ecological counter-monitoring, as it uses biological, hydro morphological and physicochemical indicators. IoT will also prove useful for minimizing losses associated with the transmission of energy between producer and consumer. As seen, modern technologies can positively impact the quality of everyday life, and not just at work¹⁵.

Changes are inevitable, as in the business of the digital, knowledge-based economy, where modern technologies hold sway, simple, material-intensive, energy-intensive, and non-ecological products do not determine the lead. Their place is taken by smart products, demand for which is systematically increasing. Meanwhile, the manufacturing potential to generate smart products is created by automation, digitization, innovation, business analytics based on Big Data, and supporting ICT systems built on the architecture of artificial intelligence and the Internet of Things¹⁶.

3.2. Crucial competencies in Industry 5.0

An essential thing that is related to the introduction of robotization and automation is the need to educate people. Therefore, in order to take advantage of new professional opportunities in the era of digitization and automation of the economy, it is necessary to develop adequate digital competences, which are a key element of the production potential of industry 5.0. This is a *sinen quanon* condition for avoiding the negative effects of Robotic Process Automation (RPA). In helping people acquire the appropriate skills and knowledge, not only employers but primarily high schools, universities, and the government should be involved. Without this, there will be no workers with the right skills for the jobs that are currently being created due to the development of technology.

The Future Industry Platform has published a report titled "Report on Empirical Research on Competencies and Professions of the Future," which not only shows a list of companies undertaking the implementation of new technologies or new competency needs but also identifies which professions are currently in demand. The professions highlighted in the figure 4 are relatively new/ unpopular professions previously. The greatest demand is for automation process specialists. The report states that as many as 65% of respondents consider them extremely important in today's (technological) times. It can also be inferred that people, whether young or slightly older, are just beginning to enter these areas of modernity to train/upskill, hence the gap is so significant; it has not yet become "popular. Acquiring digital competencies nowadays is extreme-

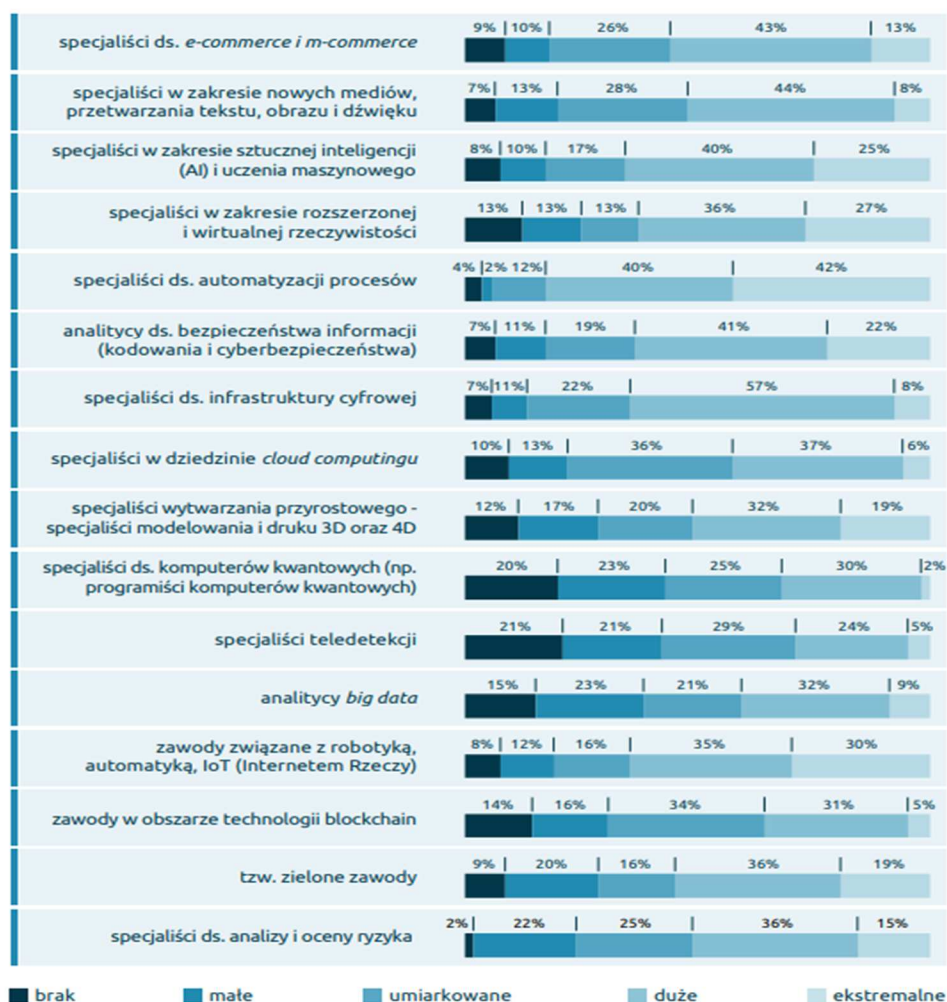
¹⁵ Balicka H., *An influence of deep learning and the Internet of Things on directions of development of integrated financial systems supporting smart cities for green economy*, "Space, Economy, Society" 2020, No. 17, pp. 77–102.

¹⁶ Ibidem, pp. 77–102.

ly significant, as it gives the opportunity for self-development, of course, but also the chance to get a better-paying job. According to the European Parliament and the Council of December 18, 2006, the rapid digitization changes show that almost all jobs require specific digital skills. Therefore, one should not fear and slow down development, but rather rejoice and take advantage of new opportunities – which is the domain of hardworking people, who not only work but constantly educate themselves, not resting on their laurels or the routine of everyday life. The list with the most important skills an employee should have include:

- analytical thinking;
- innovation;
- ability to use technology;
- social interaction;
- leadership;
- originality and initiative.

Fig. 4. Demand for the professions of the future

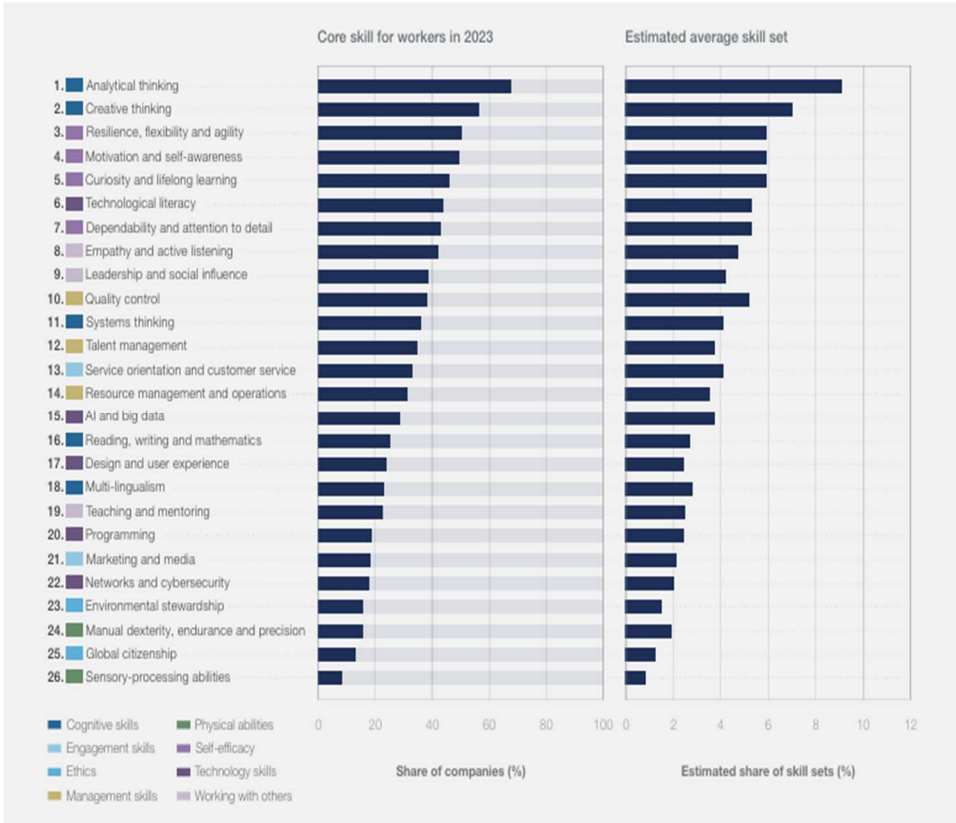


Source: Łapińska J., Sudolska A., Zinecker M., *Report on empirical research on competences and professions of the future*, Future Industry Platform, Warsaw, 2022 (in Polish).

The World Economic Forum has prepared a report titled, "Futures of Jobs Report", where they describe various aspects of the impact of automation like artificial intelligence on companies, and the job market. Figure 5. shows the basic skills needed in a job today. The skill that is most in order among workers is analytical thinking. Having the trait of creative thinking is also often in demand. The first two skills on the chart belong to the cognitive skills group, which facilitates a person's ability to process information, understand or learn and solve problems. The next three come from the self-efficacy group. They

help keep one's self-efficacy constant and more. If a person knows his or her worth and knows what he or she is capable of, can self-motivate, there is less risk of burnout and less stress, and this is what translates into results at work which can bring remarkable success to a company¹⁷.

Fig. 5. Core skills in 2023



Source: World Economic Forum, *Future of Jobs Report*, Germany, 2023 p. 38.

Companies are looking not only for employees who use various digital technologies, but also for specialists who design and develop the capabilities of these technologies. Examples of such skills include cis-physical systems integration and advanced robotics. Using the European Union as an example, ICT specialists are the fastest growing profession. They are among the top 20% of highest-paying occupations. There is speculation that there will be an increase of 1.3 million data workers in this sector¹⁸. There is a growing demand in the market for specific employee skills. Speaking of cognitive skills, an adaptable workforce, coupled with increasing complexity of tasks, gives greater demand for

¹⁷ World Economic Forum, *Future of Jobs Report*, Germany, 2023, p. 38.

¹⁸ Su Z., Togay G., Cote A-M., op.cit., pp. 341–345.

employees with strong core skills and the motivation to learn and adapt throughout their careers. The report, "Global Framework on core skills for life and work in the 21st century", conducts a literature review of both international and national backgrounds of needed skills and analyzes the impact of global factors that are driving transformational change in the labor market to highlight the core essential competencies needed to adapt to the future of work.

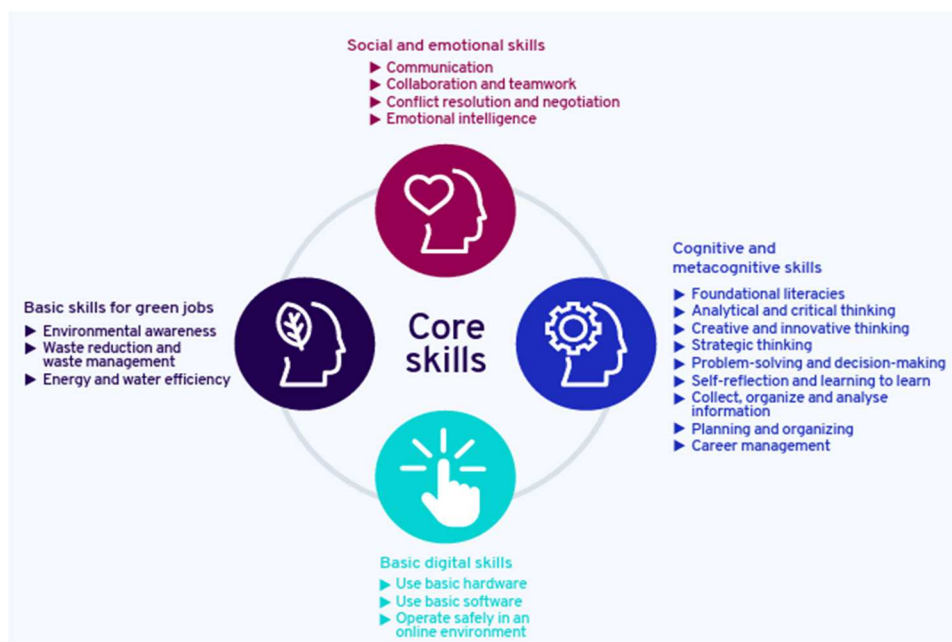
Through consultation with academics, experts in the field of skill development and representatives of national bodies for skill development, they helped to identify nineteen specific basic skills, considered indispensable not only at work, but also in private life (Fig. 6.). Social and emotional skills are the ability to regulate thoughts, emotions, and behavior. They are crucial for effective work and learning. According to McKinsey, demand for them is growing globally by 26% in the US and by 22% in Europe by 2030. These skills are essential for adapting to the future of work and raising living standards. Emotional engagement in learning supports deeper understanding. Examples include communication, cooperation, conflict resolution and emotional intelligence. Cognitive skills are the brain's ability to process and use information. Research shows that they are closely related to social and emotional skills. Examples include basic literacy skills, analytical thinking, creative thinking, and problem solving. Metacognitive skills, meanwhile, are the ability to understand one's own thought processes and apply appropriate learning strategies. They are considered key to improving learning and transferring knowledge between different contexts. Basic digital skills are a set of competencies needed to solve basic tasks related to the use of hardware and basic online operations. They allow to acquire digital skills and develop in the community at work. Core skills for green jobs include adaptation to environmental regulations, waste reduction and energy conservation. This is crucial to the transformation to environmentally sustainable economies.

This requires government support and education to promote conscious citizens and workers. An important aspect in the acquisition of digital competence is also to change the education system so that it prepares students from the beginning to work in an environment strongly oriented toward digitization. Show that routine-physical work is being replaced by more intellectual activities¹⁹. A perfect example is the University of Lodz, which, in cooperation with the Lodz Special Economic Zone, conducted research and based on this prepared a core curriculum. The purpose of this core curriculum is to facilitate young people's faster entry into the labor market and further development. Individual education is not always enough, because in many cases a team approach is re-

¹⁹ Moczyłowska J.M., op.cit., pp. 97–104 (in Polish).

quired to operate advanced machinery. One person cannot have all the necessary qualifications to effectively operate such equipment²⁰.

Fig. 6. Global framework of core skills



Source: International Labor Organization, *Global Framework on core skills for life and work in the 21st century*, Switzerland, 2021 p. 26.

The changes of Industry 5.0 have affected and will continue to affect the labor market, so working in the pristine environment will require more competencies than what was there before. Nevertheless, finishing education at a certain level is not enough. Why? Because Industry 5.0 is based on constant change, and therefore self-education is important. Education 5.0 is increasingly using distance education, which was not so widespread before. In 2020, everyone had to adapt to such a mode of learning, as the COVID-19 pandemic broke out. Schools, but also companies had to adapt quickly to the new reality, which was certainly a challenge. In some companies, the so-called Home Office is already the order of the day. The ideology of Education 5.0 should guide students to develop creative use from information and communication technologies. An ideal example of when social media plays an important role in communication is the city of Roanoke in the American state of Virginia. The city had its modest

²⁰ Grendys A., *Robotization forum: educating workers and deployment specialists*, Future Industry Platform, <https://przemyslprzyszlosci.gov.pl/forum-robotyzacji-kształcenie-pracownikow-i-specjalistow-od-wdrozen/>, [access: 07.08.2020] (in Polish).

social media presence, and thanks to it, in 2014 when a strong snowstorm hit the city, residents learned about snow removal from the city's social media. The Facebook page started gaining more and more followers, prompting the city to decide to integrate all its social media with all city departments using an integration icon. This works better than a telephone hotline in some cases. For example, this situation demonstrates that social media can support a smart city as a system that integrates information technology systems such as IoT²¹.

The cooperation between humans and robots is also important in terms of the development of human skills and trust in machines. This work can produce previously unexpected results as the two parties learn new things. However, the concept of this cooperation will only exist if the employee is able to generate more added value with the support of artificial intelligence than he would have on his own. To achieve the best possible results on the part of both man and machine, an early analysis of the skills of these two individuals must be performed. With optimal correlation, an intelligent machine enables the extension of human capabilities through detection, understanding, action and learning. A good example of such cooperation is the well-known car manufacturer Mercedes. Mercedes has replaced industrial robots in production that perform simple tasks with so-called artificial intelligence-enabled cobots and redesigned its processes for human-machine collaboration. At the company's factory near Stuttgart, Germany, human-controlled cobot arms lift and place heavy parts, becoming an extension of the worker's hands. The system allows the worker to control the production process of each car, requiring less physical effort and safer work, and acting more as a 'pilot' for the robot²².

Humans have many questions in connection with technological entities, the Internet of Things or artificial intelligence, where are their boundaries, how to coexist with them, whether it is possible to create a community with such entities. The answer is - of course yes. For example, deep learning algorithms can be useful in predicting air pollution, in fighting lawlessness, or collecting data on infra-structure. Studying air quality is important because many diseases can be avoided as a result of which the quality of life will improve and attract more residents. In the fight against crime, algorithms create a special map of predictions of associated crimes. Based on this, the police can more quickly identify the perpetrator and stop him before he commits an illegal act. The Internet of Things can also revolutionize urban infrastructure by collecting data on it. This can improve the efficiency of city management, which also leads to cost savings. To improve the lives of residents, deep learning algorithms through special

²¹ Balicki J., Balicka H., Dryja P., Tyszka M., *Social media for e-learning of citizens in smart city*, [In:] Dębicka O., Rogula-Kozłowska W. and Rogula-Kopiec P. (eds.), Proc. of the 10th Jubilee Scientific Conference – InfoGlob 2018, SHS Web of Conferences, EDP Sciences, Vol. 57, Gdansk – Nynäshamn, Poland, September 18-20, 2018, pp. 1–11, <https://doi.org/10.1051/shsconf/20185701002>.

²² Su Z., Togay G., Cote A-M., *op. cit.*, pp. 349–352.

applications can warn people of dangerous conditions such as weather. Of course, this requires special applications that need to know how to use, so it is important to show and explain already at the school level what technologies accompany people daily²³. Although it is hard to understand because things that are relatively new raise concerns. Each person must look at it from his or her own perspective, experiences with technologies and knowledge that he or she has and is expanding all the time, as the Roman comedian Terentius said, "I am human and nothing human is alien to me".

To sum up, artificial intelligence is not just a simple tool for replacing skilled labor but is also capable of creating many other jobs related to its development. As a result, even an increase in the number of skilled jobs is forecast to provide services to support the recent technology. Interest in artificial intelligence is also emerging in connection with supporting people's daily work. This also leads to various concerns on the part of people, as these are often technologies not previously used. The current global situation is accelerating the development of robots as well as the improvement of artificial intelligence to reduce human exposure to the COVID-19 epidemic. Most office workers already work from home, which creates new needs and forces the digitization of the workplace. Before the pandemic, artificial intelligence may have been seen as a threat to workers, but now the situation requires looking at AI in a whole new light.

3.3. Adaptation of education and vocational training Siemens

Innovations introduced by companies do not just involve implementing them into work systems, but managers also need to consider their employees. Not all of them are able to adapt to new things quickly and on their own, and they often need help in teaching them what works and how. Therefore, the company's strategy towards, "teaching" these people is particularly important, but also education is a key element when it comes to the changing world.

Now students are taking up careers that a few years ago a person would not have thought of. Many new majors and courses are being created for executives, for example, due to the changes. Most universities offer innovative majors and courses, such as the famous Harvard Business school or Oxford. Browsing through the website of universities in the United States, one can find many interesting courses for executives (but not only), to stay abreast of changes and later translate this knowledge to others. Examples of such courses are "Disruptive Innovation: strategies for a successful enterprise" or "Competing in the Age of AI". The former allows someone to master the knowledge of decision-making, recognizing opportunities and threats in connection with innovations. The course itself is divided into two sections: creating and maintaining a strong position in a growing industry, driving innovation, and making better and more

²³ Balicka H., *Internet of Things and Deep Learning Models in the sustainable development of smart cities*, "Contemporary Economy" 2023, Vol 16, No. 1 (40).

effective decisions through strategic analysis. The second course mentioned earlier is designed to show and understand how AI affects the business environment and how it can be used. Introducing AI into business provides many opportunities to not only grow business, but also make things easier. This course consists of two sections; presenting a business model based on artificial intelligence and creating opportunities to build competitive advantage.

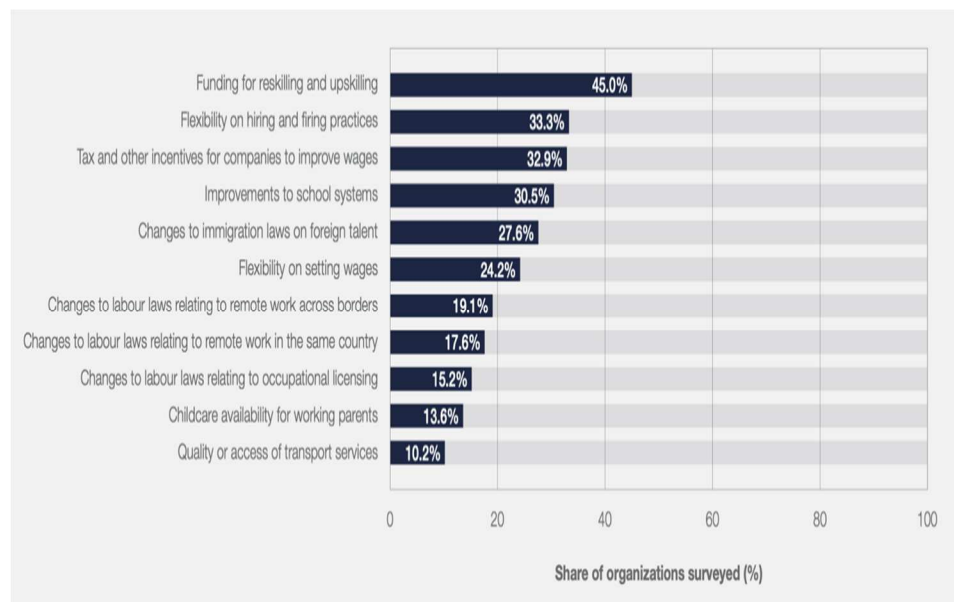
Strategies have also changed due to the industrial revolution. Companies such as Apple, Tesla and the all-too-familiar Facebook rely on an innovation strategy of looking (continuously) for the best possible solution to improve a product or service. This results in finding latent demand and even sometimes creates new demand. How does this work? Namely, the company creates new opportunities in other words new areas of competition, it does this by offering new, better, and more valuable end products of the company's operations, which is the result of a significant increase in revenue. Businesses that are guided by this strategy achieve sustained high growth and profit, but also increase their market value. Changes have also affected organizational structures in companies that implement the innovation strategy. The three main features are flexible structure, networked forms of business and open services. A flexible structure allows companies to focus more easily on the company's goal and allows them to hire people with different qualifications. However, every structure consists of two basic segments. The first is the so-called core, which will include the highly qualified employees who are essential to the long-term operation of the organization. The second segment is peripheries, where will find employees hired only for specific tasks on a temporary basis. The conclusion is that such employees are plentiful and easy to replace. This, in a nutshell, is the structure and strategy of innovation, thanks to which corporate giants are making more and more profit all the time.

The next university that the Authors of this article looked at is the University of Oxford. Here three majors caught attention. The first is the Diploma in Artificial Intelligence for Business course. Its goal is to provide the community of managers, technical professionals, and future practical leaders with the skills to ethically use artificial intelligence in their companies, or in the workplace. This program consists of four modules; Technology Breakthrough Landscape, Business related to Big Data and Machine Learning, AI in practice, Strategic Leadership in the Age of AI. Another interesting course is the Diploma in Strategy and Innovation. This program emphasizes the relationship and interdependence between these two concepts. It is designed to help understand how to introduce innovative technologies quickly and easily, but effectively. Gone are the 5-year or 10-year plans, because reality is changing faster under the influence of the dynamic pace of development of digital technologies. It is necessary to react quickly, but in such a way that it has a positive effect. During this study, the student will participate in four modules: strategy, innovation strategy, globalization and strategy and strategy in practice.

In Poland, universities also have a range of majors related to the industrial revolution. An example of such a university is Warsaw University, which has several innovative majors on offer, including cyber security or Big Data management. According to the report, "Cybersecurity. Labor Market in Poland 2023" (in Polish), there is a shortage of specialists in the cybersecurity industry, so the goal of this major is to educate graduates to fill this hole in the lack of specialists. The rapidly developing digital world needs such people to reduce cyber-crimes and improve the overall security of the country and the world. The program consists of two modules the first is knowledge of the formation and application of cyber security policy at the level of companies, organizations, state, and European institutions, and the second is the student's choice of issues in the ICT areas. The student can choose from; artificial intelligence, Big Data and data analysis, technologies for building websites and portals, basics of programming in cyberspace and web 2.0 and social media. The second mentioned direction is based on the identification and processing of large collections of digital data. While studying this direction, the student will acquire skills such as managing structured and unstructured resources, using competencies for socio-economic use, and generating new needs in the information sphere of science, education, and business. Such a graduate is important for large corporations, because thanks to his ability to collect and analyze a lot of information, the company can make more accurate decisions in the company, which leads to better profits and faster development of the company.

Companies offer several types of training, courses, etc. For employees where some change related to the innovative technology will be introduced in their workplace. This is to facilitate the work of both employees and managers, because not only ordinary employees need to undergo training, but managers as well. The World Economic Forum in its most recent report presented (Fig. 7) what policies should be introduced to increase the availability of talent.

Fig. 7. Incentives from the government to increase talent availability



Source: World Economic Forum, *Future of Jobs Report*, Germany, 2023 p. 56.

At the top of the list is government funding for retraining workers and upgrading their skills. This is to prevent large numbers of workers from being laid off and looking for new ones to replace them why throw away a person who works well and has the potential to upgrade their skills. Another three important aspects in this graph are flexibility in hiring and firing employees, taxes, and other incentives for companies to improve an employee's wages, and improving the education system so that the best possible skills and knowledge are available right from the start. It can also be seen that companies undertake employee training themselves through on-the-job training or have their own special training departments, but it is also possible to hire companies to do this. Most courses are paid for by the companies, which is ideal for both the employee and the employer, because the company will choose such a course that fits the current needs at work and knows that the employee will gain the right qualifications, and it is a long-term strategy for the employer. It also motivates the employee to become more involved in the life of the company and will increase productivity at work.

The company that the Authors selected and described as an example of one that effectively helps employees adapt to change is Siemens. It rises to the occasion when it comes to supporting employees in terms of the technologies they introduce, but also supporting human rights. There is no place in the company for any discrimination, because for them every person is valuable and important regardless of culture, age or appearance. For example, the global program just created by Siemens - Gender Equity Program, is based on equalizing the differ-

ences between the male and female sexes, so that women have the same opportunities at work as men. Siemens also points out that women make up more than half of the world's population and a little less than half of the workforce. According to the Siemens Sustainability Report 2023, women's employment at Siemens in 2023 was 27% of all employees. This is a lot looking at the fact that in some companies the share of women in companies is low²⁴.

The Authors undertook an interview with selected management people at Siemens and asked some questions about the changes and competencies of the workforce. The Authors learned that the company engages in many areas of life and introduces its modern technologies there. For example, in medicine, Siemens has improved the process of creating prostheses for amputees. The prostheses are 25% lighter than previous ones and 10% cheaper, which is a big plus for patients. In industry, in cooperation with SKF, they have developed better seals for bearings and lubrication systems, which has allowed SKF to achieve transparency in production, efficiency and resource utilization in its factory. In agriculture, specifically in the production of Xiao Guan tea, Siemens has put forty-six intelligent robots (controlled by artificial intelligence) to work recognizing leaf impurities and eliminating them. They then perform the next steps involved in processing tea leaves until the last step, which is packing and stacking pallets in a high-tech warehouse (unmanned warehouse). Managers responded that the technologies introduced by Siemens have an impact on employee competence, as employees must adapt to new systems, which are often not easy to master right away, but the company tries to help employees adapt to the new reality as much as possible and offers many courses and support from them. Future candidates should acquire the knowledge and skills to operate the new systems at the educational level so that the employer will want to keep him and further improve his skills and knowledge.

Managers were also asked how the company manages the training process for employees to adapt to the changing environment. Siemens has prepared a number of training modules to help acquire the knowledge needed in the workplace. The modules are publicly available on the official Siemens website. One of the respondents highlighted that even student could use their modules, as they are aligned with technical degree programs. The modules were described with three features:

- practice – oriented-they are tailored to training professions and optimally aligned with study programs, e.g., mechatronics, automation 5.0;
- versatile – the content of these courses can be used for several types of activities, e.g., project work, laboratory exercises;
- interactive – the modules have not only text in them, but also videos to make the content more interesting and support learning.

²⁴ Siemens AG, *Sustainability report 2023*, Germany, 2023.

From such courses it is possible to learn how to use the programs that Siemens uses, how to program or design 3D models. Step-by-step instructions on how to download these courses are also posted on the company's website. The company also has special personalized development programs that are tailored to the needs of their employees. Another issue the author raised is taking measures for sustainable competence development. Of course, the company offers all kinds of assistance to people affected by automation and AI implementation, as increased technologies will be introduced in the future, so it is necessary to prepare employees for these changes. Siemens is partnering with WorldSkills International, an organization that aims to get young people interested in technology and raise the level of education, specifically related to technology, around the world all the time.

The last question that Siemens managers were asked was related to the challenges and opportunities of the technologies being introduced. According to them, the main challenge for companies that implement innovations is precisely adapting employees to it. This is not an effortless process, because a person cannot be programmed to be the way someone would like it to be, as is the case with machines. The company is very committed to eliminating these challenges, because it knows how many benefits there are from human-robot cooperation. Examples include optimizing the production process, increasing product quality or greater precision, as in the case of the Da Vinci robot.

To help employees adapt and acquire the right competencies, Siemens has established a special training portfolio to expand and develop key competencies. Everyone receives the appropriate courses for their positions. The pace of technical development is forcing the company to constantly improve the skills of employees at every level. Investing in education, vocational training (VET) and talent induction programs helps to attract as well as retain talent in the company. This is a big plus for the company, as they then have some staff who already have the necessary skills and can even assist their colleagues. Siemens has a special department, P&O Talent & Leadership, which "takes care" of talent, but also seeks and acquires them. Thanks to them, everything is under proper control. They also place great emphasis on the idea of continuous learning, because with such rapid technological development, it is impossible to work only on what one has learned during one's education.

In summary, technological advances at Siemens over the past few years have been tremendous in helping many people and industries. Through this, the requirements for employee competence have also changed, as advanced AI-based systems require more knowledge in this area than before. However, it is safe to say that Siemens is incredibly supportive of its employees during the introduction of recent technologies and does not allow anyone to feel excluded by this. Through its publicly available courses, not only Siemens employees can get further training, but other people will also benefit.

Conclusions

Artificial intelligence has already revolutionized many sectors and continues to develop rapidly. The changes caused by the implementation of AI have left their mark not only on workplaces, but also on society and the economy. Thanks to the latest achievements, people have begun to think differently and positively perceive changes that improve their workplaces.

The results presented in this article confirm that modern technology and artificial intelligence do not pose a threat to humans and companies are not going to replace humans with machines. When some jobs are closed, new ones are created in their place, the only problem is retraining or upgrading competencies in a relatively short time. However, looking at the Siemens company mentioned in the paper, this is not a big problem. Thanks to various courses, coaching, a person can acquire these skills. Of course, not every company offers such courses, but there are external companies that deal with such things and will certainly assist a person in acquiring the right qualifications for him. In addition, a person should not be afraid of introducing innovative technologies or have concerns about his skills, on the contrary, he should go out to meet them. When a person learns to ride a bicycle, he or she does not know how to ride right away, but needs time to learn, and the situation is the same here. It is necessary to have faith and a good attitude to the changes being made.

Taking into account the results obtained by the Authors of this article, it can be concluded that there are very few people on the labor market who are immediately qualified (or at least close to it) to operate such systems. The requirements for the competence of an employee are constantly changing, and having specific character traits and personality, allows such a person to adapt much more easily to the changing environment. There should be some kind of reform in (early) education that will prepare children from an early age to work with robots and artificial intelligence. New majors in college allow people to get the right skills before starting their careers, which also translates into better jobs in the future and opportunities for advancement. People's attitudes are slowly changing towards the changes being introduced, but there will still be individuals who will reject innovations in favor of their routines. People in this regard should support each other, not ridicule that someone can do something, and the other person cannot. The state and companies should take a greater interest in improving the skills of employees, because not every company, (especially the smaller ones, has the funds to organize professional courses by which they lose out and know that these technologies can bankrupt the company, rather than raise their statistics.

However, it is important to keep in mind certain limitations of this article, such as unrelenting changing statistics and technological advances. The authors of the Futures of Jobs report themselves stressed at the outset that the COVID-19 pandemic has strongly contributed to accelerated technological progress, so that their statistics have changed a lot. Inventions designed by geniuses are

able to become known overnight, and this is already translating into some changes at work, for example. It is known that these changes are not introduced immediately, but the employee should already be prepared to adapt to them.

The Authors hope that their article will contribute to further discussions on improving or retraining employees, because it is not only an employee's problem, but also a problem of the company, the state and the education system. Without these three institutions combined, raising the competence of an employee will be exceedingly difficult. A person will not be able to do anything, because not every person has so much self-denial in himself to search, find out and learn things he has never heard of before. If a person from the very beginning had the opportunity to learn about at least some of the new innovations introduced since, for example, High School, Technical School and the introduction of the idea that a person learns all the time, it would not be a surprise when they go to work and have to take courses, because it turns out that their qualifications are too low, despite graduating from a super university. It is known that some people did not live in such times and this revolution came quite quickly, but society should not exclude these people only help them, because without this help, they will not make it on their own. Everyone should have equal opportunities no matter how old they are or where they are from. The future will bring more revolutions and technology, also society should be prepared for this, even in the slightest.

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