

# The impact of technology on changes in labor markets and competences

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**Abstract.** The paper examines an importance of AI and e-technologies and their key roles in such unexpected situation as COVID-19 and the emergence and progress of artificial generative technology. The authors propose diagnosis of Polish labor market which had to answer to both challenges of last years: technological and civilizations changes as well as post-pandemic time. The situation of currently required skills in Polish labor market under conditions of AI emergence and acceleration is treated as similar to circumstances in education, where one of the most needed skills became communication competences and dealing with IT, ICT, new media and AI technologies. The authors also raise a pivotal issue of new required skills and competences of coping with e-technologies: many jobs will be eliminated whilst others will be created. This means that future workers should be prepared to change their jobs and, perhaps, to work for more than one employer at the same time. The main method of research which is involved within the article is a desk research and review of the latest data and reports.

**Keywords:** Polish labor market, pandemic, skills, competences, new technologies, remote and distance work, AI (artificial intelligence), robotization, labor market, Covid-19 pandemic, professions, competences.

## I. INTRODUCTION

As each generation of young people entering the labor market in Poland, but also in the world, face new unpredictable challenges. Next to the inevitable and ominous consequences of the next, fourth - innovative and industrial revolution such as stagflation, de-globalization, increasing globalization tensions, post-pandemic quasi-recessions or a new wave of unemployment, there are ominous and unoptimistic predictions regarding the robotization and mechanization of the labor market in services, production, and even art and film (The recent strike by actors and screenwriters in Hollywood stemmed from fears that their professions would be dominated and eliminated by AI.).

Young people, because of their nature, perceive such trends and directions more optimistically than analysts or observers, because they become a critical part of the development and implementation of AI generative technology. Will there be, as has been the case in history in times of acceleration and change, a natural generational conflict regarding the approach to professional competences and the future labour market? What is significant is the appearance of recent appeals, statements and manifestos to suspend work on the development of AI, which are motivated even by experts and producers themselves, innovators of this industry - Sam Altman from ChatGPT or Dennis Hassabis from Deep Mind 1. They seem to be contradictory in their attitude and tone: on the one hand, they express concern about getting out of control of AI technology, which is de facto still unknown in its multiple effects, but on the other hand, the ambivalence of these behaviours reveals the need of powerful managers to create publicity and build an image [1]. The New York Times published information about the enormous threat that artificial intelligence may pose in the future. To put it bluntly, representatives of main AI companies such as OpenAI, Alphabet (Google DeepMind), Anthropic and many other laboratories working on AI warn that artificial intelligence may become an existential threat to humanity and should be treated as a social risk on an equal footing with climate extinction and pandemics or weapons of mass destruction. The very high recent activity of AI industry leaders also corresponds to the above-mentioned apocalyptic-pessimistic enunciations and decisive reactions of politicians in the EU institutions, the White House and the American Congress, in order to at least, if not strictly control, then at least regulate or almost slow down the dynamic direction of the fourth and the fifth industrial revolution or the so-called Industry [2]. Such a sort of peak of emotions and tensions around AI technology, or rather side effects of these struggles, can be observed, for

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example, in the case of the "conflict" between OpenAI shareholders and S. Altman himself and a group of almost 700 employees supporting his former CEO, who threatened to leave for the competition; The background of the dispute is probably the generational approach to the future of the use of AI - a dilemma that will haunt us for a long time: strict regulation and control of the implementation of artificial intelligence or its further spontaneous progress.

Interestingly, mostly the West or countries with transparent legislation process face a great challenge of defining the framework, legal basis, limits of interference and the scope of AI's operation in the functioning of these societies. It is worth noting that already in this year (2023), representatives of ChatGPT were questioned before the Senate committees of the United States Congress in May and July, and this is certainly not their first summons before the hearings of the American Congress, which also awaits other creators and technology companies of AI industry; similarly, in the EU Parliament and in the EU Commission, intensive legislative work to regulate the use of AI is already being completed (Sam Altman from Open AI has threatened that if regulations in the EU as the "AI Act" go too far, he will withdraw ChatGPT from the EU area). There is also a concern on the argument among the most important companies as OpenAI, Google – the owner of You Tube, Meta over digital data rights and corporate policies, especially it has to do with gathering copyrighted data from the internet.

In the text the authors will try to examine an importance of AI and e-technologies and their key roles in such unexpected situation as COVID-19 and the emergence and progress of artificial generative technology. Also, the authors will propose a short diagnosis of Polish labor market which had to answer to both challenges of last years: technological and civilizations changes as well as post-pandemic time. Referring to Polish as well as global labour market the authors point out new required skills and competences of coping with e-technologies. In this context there will be presented, based on a few chosen reports and desk research, which jobs/posts will be eliminated whilst others will be created.

#### *A. What will be the competences after the challenges - COVID-19 and AI?*

Recently, especially during the Covid-19 pandemic, there have been more and more comparisons that often point too hastily in the context of developing artificial intelligence, what professions can be replaced by robots and AI. However, one should be careful not to make too hasty judgments, but vigilance and patience in this respect is also advisable. In this context there is not without reason that the modernization of Polish qualifications was introduced legislatively a few years ago. It began with the adoption of the Act of December 22, 2015 on the Integrated Qualifications System [3], which involved the adoption of common rules regarding qualifications operating in various areas. The integrated system consists, on the one hand, of elements already functioning in Polish social and economic area, and on the other hand, new instruments enabling effective integration of the entire system, the most important of which are the Polish

Qualifications Framework (PRK) and the Integrated Qualifications Register (ZRK), in which all qualifications are included in the integrated system. To all qualifications included in the integrated system are also assigned the levels of the Polish Qualifications Framework (PRK level). In the same time both phenomena are driving and influencing skills and labour market in Poland: the development of communication technologies, facilitated by the COVID-19 pandemic, also indirectly accelerated the development in the field of artificial intelligence, which could easily replace humans more effectively, regardless of sanitary or antiseptic regulations and restrictions. Almost a decade ago (2012), the indicators of professional development and competences, or long-learning (lifelong learning) were not optimistic yet: the highest rates of adult learning for many years were recorded in the Scandinavian countries, where over 25% of adult inhabitants for the last four weeks have been learning in a formal or non-formal way. Already a few years ago, before the coronavirus pandemic and its variants came up, some experts had predicted that more than one third of the competencies (35%) that are considered key to today's workforce would change in the near future [4]. The fourth industrial revolution has already brought us innovative and groundbreaking solutions and means such as advanced robotics, autonomous transport, artificial intelligence, e-learning, advanced e-commerce services, biotechnology... etc., although not all of these phenomena are yet widespread. As predictions continue to indicate, the open "door" of transformation and evolution of forms of work can no longer be closed. Therefore, from the perspective of technological changes affecting the labor market and employment structure, it is worth to specify that we are in a period of transition from technology 4.0, based on wireless communication (mobile devices or computers) connecting people and objects and integrating physical and virtual worlds over realistic time (e.g. compatibility of sensors, control, navigation and driving software for Uber, Tesla and Nissan autonomous driving technologies) to technology 5.0, which is still largely a mystery when it comes to implementation.

However, today we can point to certain phenomena and technological revelations, such as solutions and models integrating lasers, radars, high-power and sharp cameras based on solar energy or alternative energy sources. Certainly, the revolutionary aspect of WEB 5.0 in the social and human resources context will be the evolution of the globalized network in an emotive direction, disturbingly replacing the employee, e.g. machines that are able to decode virtual content and react to it, and then autonomously decide on the appropriate action (so-called smart cars, smart house...etc.). In the social and human resources aspect, a virtual reality or hyperreality may even lead to replacing an employee a real person with a hologram or "avatar". Analysts of future competences expect that the future demand for work will focus on unusual and innovative variants of professions requiring high qualifications, interpersonal and creative skills, but on the other hand, not in every case the employee will be able to be replaced by artificial intelligence. Occupations, which require low qualifications and the so-called "non-routine" work - such as catering or security services - will still require human staff [5]. However, if new administrative and office

applications result in a reduction in the number of administrative staff and a simplification of bureaucratic procedures, then their implementation and service will require the work of new specialists. To create "smart" applications, software must be powered with knowledge in a format that they can read. New knowledge base structures should be created and implemented by specialists. Building, for example, multilingual knowledge bases and then training in such software will be one of the future professions that will replace routine office work. It can be argued that the digital revolution will cause young people to spend even more time in complete physical isolation, and crisis or pandemic lockdown situations, such as we witnessed meantime in pandemic time, may strengthen this direction of development. Today's crisis in child and adolescent psychiatry in Poland is also the result of prolonged Covid isolation - both in schools and in labour market. More and more professions requiring individual work with data, knowledge resources and performing cognitive tasks combined with virtual communication with others (both people and machines) will inevitably lead to a revolution in human relations, communication and forms of employment. The COVID-19 pandemic has had an unprecedented, far-reaching impact on economies and societies around the world; it led to a decline in economic activity, loss of work and income, and, consequently, a sharp increase in unemployment and underemployment. Subsequently, supply disruptions and lack of demand have also had a devastating impact on labor markets with huge incomes, productivity and job losses, especially in the hardest-hit sectors such as tourism and manufacturing. The crisis also generated serious re-allocations of employment between sectors, and in the phase of recovery and return of economic activity, it became necessary to implement the prepared recovery and stimulus package, also based on well-prepared staff, especially those equipped with new competences and skills necessary to cope and solve previously unknown problems. The COVID-19 pandemic has not only disrupted educational processes, including vocational education, but also revealed and aggravated unresolved shortcomings remaining from before the crisis, such as lack of technological infrastructure and digital connectivity, gaps in competences, online teaching and learning, shortage of digital skills and qualified workers in given industries, unequal access to education and training among students and employees, lack of digital and pedagogical resources, lack of educational platforms and support services, and financial constraints. The pandemic and post-pandemic have accelerated the development of new competencies. Placing emphasis on this educational element of personal and professional preparation will become a joint responsibility of governments, social partners and individuals, as it will affect directly onto mitigating the economic crisis and its side effects, and will also support activities in getting people back into employment through partial retraining and changing completely occupation, building their future employment resilience. Many reports have already confirmed that the coronavirus pandemic has not only exposed but also exacerbated the "digital divide", including the digital skills gap, between countries, between urban and rural areas, and between women and men. Women, young people, older people and migrant workers have been

particularly hard hit in this light. In the United States, despite trillions of dollars in stimulus and social programs, several million women (2022) did not return to employment: for example, in one year – February of 2020-2021, 2.4 million women left the American labor market [6]; especially young mothers - choosing the comfort of hybrid or online work and raising their children rather than the intensive professional career model that has been promoted for decades. The pandemic and even more post-pandemic situation revealed the following further shortcomings - especially soft skills noticed by employees in their daily work, i.e. identification of stress and emotions in employees, proper cooperation with other entities and services, effective managing the remote assistance delivery. Interesting, but the period of the pandemic has reevaluated not only the approach of professional duties and careers aiming "at all costs", prioritizing more the "work balance", the quality of the workplace environment and the employee market, but also raised in the hierarchy of professional competences and professions activities in the area of support, emotional counseling and broadly understood help.

As previous research indicates, the success of an organization is less influenced by the organizational structure, but increasingly by the unique, innovative competences of the people who create it and its leaders. This increasingly also applies to public organizations, including social policy entities. Of course, there is no one best definition of leadership, but it may be worth quoting the definition proposed by Gary A. Yukl - "leadership is a process in which an individual exerts intended influence on other individuals in order to designate, structure and facilitate the activities and relationships occurring in group or organization" [7]. For a long time, considerations on leadership in public institutions treated leaders primarily as administrators whose task was to maintain existing bureaucratic systems, not to create innovations or take the risks associated with introducing changes. Meanwhile, modern times also encourage and even sometimes force leaders of managing staff and human resources to look for innovative solutions, expand work balance and bear the risks associated with transforming social reality.

Among many concepts of leadership and business management, an interesting proposition is the use of the concept of servant leadership. Servant leadership means serving both your customers and your colleagues. A leader leads, but his strength is motivation and very good relationships with his co-workers, to whom he gives space and freedom, also to make mistakes. Servant leadership is essentially responsible leadership, where the interest of the whole or the group is more important than self-interest. An important element of leadership is transformation, i.e. striving for change while maintaining the perspective of long-term development and ethical actions [8]. Young management staff, for example in the area of social assistance services, consulting, care... etc. stated that the competences of the supervising staff of the social welfare system that should be improved in the context of the COVID-19 crisis in terms of leadership are mainly: facilitating (creating conditions) for changes and innovations, as well as interpersonal and communication skills. Analytical and critical thinking skills also turned

out to be extremely important. The consequence of these leadership gaps is a suggestion for young supervising staff in the context of the COVID-19 crisis, but also before the pandemic, to build relationships with other institutions in the system to increase the quality and quantity of services provided, create partnerships, connections, work in interdisciplinary and task teams and establish alliances with enterprises, the non-governmental sector, local authorities, etc. There are still, although on a smaller scale, instruments that can influence the improvement of the competences of young management staff. Already at the recruitment level, it is worth paying attention to the candidates' non-formal qualifications [9]. Job recruitment should focus on two factors: concentration on formal qualifications (documentation confirming educational and professional preparation) and the so-called soft competences - or "social and emotional intelligence", increasingly emphasized in foreign language literature, which in Polish education are constantly not mentioned much and discussed in the teaching process at all levels of the educational system. Currently, there is an ongoing discussion at the international and national level - what will be more important in the future of competences - whether "dry", formal qualifications or skills such as empathy, communication, interpersonal skills, teamwork, assertiveness, listening skills, argumentation skills, suggestiveness ...etc.

In this context of the future of key competencies, it is worth quoting Mario Reich, who claims that the future will be determined by competencies and therefore, in each sphere of life, it is worth seriously considering defining the desired competencies of staff and ways of developing them. According to the Swiss scientist, the best employees, regardless of the industries they represent, will be those who combine the following competencies [10]:

1. Personal competences: SELF - these are innate and digital abilities, verbal and written communication, negotiations, critical thinking, future thinking, imagination, creative problem solving, innate entrepreneurship; personal development.

2. Social competences (OTHERS). These are the skills of building and maintaining relationships, partnership in life, successful parenting, cooperation, trust and respect, responsibility and empathy.

3. Professional competences (WORK). These are such competencies as efficiency, effectiveness, value creation, adaptability, cooperation, co-creation, entrepreneurship, and specific professional and managerial competencies.

This is one of the many propositions of categorization of groups of currently needed competencies in rather general approach of daily life aspects.

#### *B.AI is already changing the labor market and the competencies highly within needed*

It seems necessary to acquire new qualifications and skills that will enable full use of the opportunities related to the development of technologies such as AI. Openness of both employees and employers to changes and flexibility in adapting to them is also important. It is perhaps a bit exaggerated information that there are currently 3 billion digital workers working for various

industries, not only IT or ICT. At least one corporation in four will introduce by 2024 [11]. AI technologies that will not only replace 69% of the management activities of managers and executives, but will also introduce technologies and applications that will monitor the work performed remotely/hybrid, will be more efficient and effective than the management staff, and especially will be resistant and more effective than humans (fatigue, human errors...), because it is effective 24 hours per day [11].

In the moment as the development of generative artificial intelligence reaches its peak, many people from various industries fear losing their jobs, especially representatives of creative industries. Instead of being afraid that generative AI will replace today's employees, we should rather adjust to it and, as the present experience indicates, follow the first signals of the technological revolution, following the intersection of AI and the labor market/competences/technology, being vigilant and ready for the highly probable changes in the economy. Despite lawsuits and strikes in creative industries, this trend is certainly growing and will be irreversible. Therefore, the generative AI revolution is inevitable despite last attempts to control more strictly by the law and regulations. So, instead of being afraid, it is better to know how to familiarize yourself with the AI sphere and adopt it as quickly as possible. Generative artificial intelligence is probably the fastest to initiate a revolution in media production, but it also raises widespread controversy, leading to lawsuits and strikes in creative industries, led by the biggest Hollywood stars, such as Kevin Bacon, Jamie Lee Curtis and Susan Sarandon. However, as Lev Manovich, a long-time researcher of new media at New York University, aptly notes, the apogee of the development of "generative media" means a new revolution in media creation, which has been developing for over 20 years [12]. What is also important, McKinsey predicts that by 2030 30% of work hours in the US economy could be automated, further accelerated by generative artificial intelligence. Previously, Goldman Sachs predicted that 300 million jobs would be lost in services and production, and at the same time, as indicated, the production of objects and services will be at a better level than currently (thinking paradigm: man as the weakest link in a given process of production). Whether these are currently verifiable or too abstract statistical values thrown into the public space for various reasons remains to be seen. There is certainly still a lot of "magical craft" in these projections and we are dealing with issues and actions so dynamic and to some extent unpredictable in short terms. For instance, here is a statement from 12 years ago, which can still be agreed upon today - it has not yet been fully fulfilled, despite the passage of over a decade: "Artificial Intelligence (AI) and robotics will drastically decrease the number of job posts currently available, but that technology will in itself also create new work opportunities in its turn" [13]. Already back then (2012), the predicted disaster on the labor market due to AI did not materialize, at least COVID-19 and pandemic lockdowns and previous recessions wreaked more havoc in this respect. Tendencies and directions of scientific and technical progress, which include, among others: new and modernized products, production processes and methods of organization and management, will radically change production methods,

and this in turn leads to profound changes in the labor market, are already described and diagnosed also by Polish social politicians and academics.

Indeed, C. Freeman and F. Louca already at the beginning of the 21st century described these changes in terms of transformations of the dominant technical and social paradigm [14]. Societies that develop systemic forecasting skills faster have a greater chance for development. The condition for achieving a competitive advantage for entities is to carry out digital transformation. The digitization of society is identified with the use of digital techniques in almost every area of life and economy, in order to, collecting, processing and sharing information, disseminating knowledge, facilitating the acquisition of knowledge, but also improving trade and social communication. It can contribute to increasing professional opportunities for those who are particularly excluded territorially or even by lack of access to modern infrastructure, as well as to reducing social inequalities and, just as the first and subsequent globalizations did, even greater "democratization" of access to knowledge, competences and science. The necessary condition for using it is to have basic digital competences, i.e. a knowledge of digital tools and the ability to use them, because modern technologies are already present in the everyday professional life of most employees. However, returning to the nearer future, tasks related to physical work and repetitive intellectual activities may gradually be limited. This trend is already visible in machine, industrial and mining production technologies, and recently in the military - which we can see in the Russian-Ukrainian conflict or in special operations of the secret services. From the point of view of the labor market, at the very beginning the goal of automation was to reduce physical work and routine intellectual activities such as entering data, checking formal correspondence, performing calculations... etc. After all, the fundamental goal of the so-called "AI" was the creation of machines and patterns that would be able to create things in a way that would be considered intelligent if the work was done by humans. Nowadays, most administrative tasks also involve entering data or documents received from users of electronic systems and verifying them. Such activities can already be or are being massively substituted today, e.g. electronic banking has significantly reduced the interactions of bank customers with its employees, because customers can carry out many transactions on their own, and banks, as economic entities focused on pure profit, often lay off long-term and experienced employees. In mass trade, automation is already a certain necessity, which we observe every day entering the markets during packing purchases and goods at the self-service checkout: the example of service robotization, especially in trade, very well illustrates its use for several years when shopping in the USA by the largest discount chain of WALMART stores, although also Google recently presented the simplest robots for everyday shopping:

"The robots, which are about two feet tall, use a camera to determine if items are out of stock, have wrong prices or are missing labels. The information is transmitted to store management so personnel can address problem areas. Walmart, which has been criticized in the

past for out-of-stocks, said it is keen to use automation "to handle tasks that are repeatable, predictable and manual" [15].

There is general agreement that logical thinking, based on several intelligences at the same time, e.g. emotional and cognitive intelligence, will be a key skill of the future. Additionally, many administrative tasks will be automated and employees will need significant skills in problem solving, communication and the use of virtual platforms. Let us add that the Bard chatbot, despite its popularity and surprising functionality (it can transform the simplest and shortest formula written by E. Hemingway into a syllabotonic poem in 5 seconds), is still unable to completely replace an employee in many functions and, just like a human, has moments of weakness, the so-called "hallucinations" [16]. Although much of the current scientific and popular science literature focuses specifically on the skills and competencies that will be most desired in the future, for illustrative and comparative purposes, it is worth presenting some innovative professions in the field of information technology that may dominate the future labor market. These "professions" will immanently force the market to adopt the most adequate forms of employment or the provision of appropriate services [17]:

1. Machine learning specialist. The demand for cognitive computing skills is gaining attentions. Candidates should be skilled on unstructured data processing, statistical extraction of entities, machine learning, natural language processing, and online search. Requirements are degree in Machine Learning, Statistics, Applied Mathematics, Computer Science, Information Systems, or related quantitative disciplines, with a minimum of five years of relevant experience.

2. Blockchain engineer. A blockchain engineer is a person who is responsible for everything having to do with Bitcoin in a company and design procedures in order to accept and process Bitcoin transactions. They must be expert in cryptography, distributed systems, hash algorithms as well as in trading platform and secure identification.

3. Virtual reality engineer. Virtual reality is not a prerogative of game applications. A virtual reality engineer is an expert in the definition and execution of advanced technologies for Virtual Reality.

4. IoT architect. An IoT architect's job consists in designing end-to-end IoT solutions that solve real business problems in many fields (for example, automotive, aerospace, medical equipment, manufacturing, electronics and telecommunication, etc.). The IoT architect position combines domain knowledge, technical skills and the necessary competence to integrate various disciplines.

5. Cybersecurity specialist. A cybersecurity specialist analyses alerts from multiple and various sources within both public and private organizations in order to determine possible causes of such alerts, identify and distinguish between false and real cybersecurity incidents. Indeed, a cyber security issue takes places if an adversary seeks to gain something from their activity e.g. obtain

private information, undermine the system, or prevent its legitimate use [17].

Experts expect that, the future labor demand will be concentrated on high-skilled non-routine jobs involving interpersonal skills and/or creativity and low-skilled non-routine jobs, such as food services and security [5]. At the current trend, the share of men between 25 and 54 out of work in the United States is estimated to reach 24 percent by 2050 [18]. On the other hand a few years ago, for instance the Foundation for Young Australians' (FYA) and the AlphaBeta Corporation Ltd (2017) have explored how automation, globalization, and flexibility are changing the future of work, highlighting what the main implications will be for young Australians. Some interesting indications contained in this analysis are the following [19]:

1. Future pharmacy assistant - the time spent on store admin tasks (such as stocktaking and ordering) will be reduced from 22 hours per week in 2006 to 6 hours in 2030.
2. Future electronics technician - the time spent inspecting equipment will decrease from 9 hours per week in 2006 to 3 hours per week in 2030, whilst scheduling will also be cut (down from 11 hours to 1 hour); on the contrary, time spent interacting with customers or colleagues will increase from less than 1 hour to 4 hours, and time spent analysing product data will increase from 0 hours to 2 hours.
3. Future teaching/learning - by 2030, teachers will routinely use digital technology for lessons and to support students' self-learning. People will spend many hours learning on the job, and continuous learning will be a relevant part of everyday engagement in work.

From these days perspective we can conclude that the mentioned Australian report gathering data from almost 10 years ago also could not be accurate and was not able to predict exact shape of the future labour market for young Australians because simply was not able to predict the influence of post coronavirus pandemia effects and conditions of AI development acceleration. There is a broad consensus that smart thinking will be a crucial future skill [20]. Since many administrative tasks will be automated, workers will need strong skills in problem solving, communication, and the use of digital platforms. Moreover, it is expected that non-permanent and remote workers will make up the majority of workers, and consequently the need to collaborate across networks and lead by influence will increase. Finally, future work in the time of post-pandemic will be more flexible and independent and, accordingly, workers will also need to have an entrepreneurial mindset. A recent study, conducted using original survey data gathered from a sample of 10,000 individuals, analysed the possible impacts of artificial intelligence and robotics on employment [21]. The results of this investigation suggest that: [...] malleable/adaptable high skills acquired through higher education, particularly in science and engineering, are complementary with new technologies such as AI and robotics. At the same time, occupation-specific skills acquired by attending professional schools or holding occupational licenses, particularly those related to human-intensive personal services, are not easily replaced by AI and robots [22]. The emergence of employees performing

new professions also in Poland and the increase in demand for employees with specific competences will enable better use of new technologies, which in turn will influence changes in the earnings structure. Examples of new professions: application developer, blogger, vlogger, drone operator, information security engineer, but also empathy trainer, transparency analyst, artificial intelligence strategist, manager for relations with machines. Therefore, scientific and technical progress forcing transformations in the organization of production processes will significantly affect changes in the labor market that shape the professional aspirations and educational aspirations of current and future employees.

What emerges from the diagnosis is the importance of developing malleable high-level skills through postgraduate education and the development of personal skills specific to human-intensive services. In fact, skill shortages can compromise the ability of firms to innovate and adopt new technologies, whilst skill mismatches reduce labor productivity due to the misallocation of workers to jobs. As a consequence, anticipating emerging skills is crucial to harmonizing the impact of technology in the labor world.

## II. MATERIALS AND METHODS

Authors of this review of labour market changing in Poland as well as in global scale in the context of acceleration of AI technology tried to gather the latest material concerning the issue basing on the interviews [23], the own research made by authors on the lack of needed management skills during the last COVID-19 epidemic period in Poland [24], conference sessions on the current situation of competences and labour market in Poland [25]. Therefore, the main method of research which is involved within the paper is a desk research and review of the latest data and reports on the given issue. A small amount of contribution comes from the own experience of the authors who have participated in numbers of social projects concerning of labour market in Poland in years of 2012-2022.

## III. RESULTS AND DISCUSSION

We honestly admit that when it comes to replacing certain professions with AI, we are constantly in the area of indicating tendencies, predictions and approximate forecasts. There are still not too many cases in the Polish labour market where some human posts have been replaced by complete AI application. We meet rather semi AI solutions such as in services of IT, social media, training services or medical. After our review we mostly agree that the new technologies enable the creation of innovative products and services, increase productivity and work efficiency and the quality of services, but also enable the transfer of digital information between products without human intervention. AI does not have the competences that will allow it to solve current problems, especially unusual, individual ones in medicine or high-tech. There are 5 key areas of artificial intelligence development:

1. Image recognition and processing technologies;
2. Language processing technologies;

3. Virtual assistants;
4. Autonomous robots and vehicles;
5. Machine learning [26].

Finally, it is worth recalling again a quite radical forecasts with which we initiated the above considerations and review of the situation - robotization of the labor market. In the US, approximately 40% of current jobs will be filled by robots in the next 5-10 years. In AD 2024 year it is still hard to imagine those predictions when the rate of unemployment is still below 4% and many Americans, mostly women, have not returned to labour after COVID-19 yet. Researchers from the University of Oxford have published already in 2019 a detailed study on the potential impact of computerization on employment in the United States. They included among others the most at-risk professions:

1. Watchmakers,
2. Machine operators (many different subcategories),
3. Cashiers,
4. Dispatchers,
5. Drivers,
6. Cooks,
7. Postal officials,
9. Garden designers and greenery conservators,
10. Installers of electrical and electronic devices, printers [27].

Although we live in 2024 and those mentioned posts still exist in American labour market and are applied in fact mostly by immigrants though. While automation of these professions is possible in the near future, it is worth noting that it will not always be desirable. Social issues and desire of human interaction will be also highly decisive referring to the mentioned processes. In many situations, the presence of a natural person is highly needed. For example, in gambling field there are devices which can be (and are) built to replace dealers, but the desire for human interaction and empathy still drives at least some gamblers to play at the table rather than on a slot machine. However, we should mention also on the professions that are least susceptible to automation such as: sports therapists, audiologists, prosthetists, fabric and clothing designers, nurses, beauticians, veterinarians, photographers, florists and various types of artists [27].

According to our predictions in the Polish Labour market the process of implementing AI will be slower than in the EU, but we estimate that around next five years in the Polish commercial and public health services there will be at least one model robot of the AI providing the given medical service. The most vulnerable service providing areas of implementing AI technological solutions or semi AI will be production industry, education, medicine, social media, show business&media, IT industry, services with non human contact, some parts of agriculture, energy, military, administration, finance&banking, programming.

We claim that the most popular use of AI technology in near future will be a semi AI used or hybrid models where the the human presence will be indispensable as a checking& security factor. Therefore, current applied AI solutions proves that in logistics and industry, artificial intelligence already is used to reduce the carbon footprint of companies; shows how to reduce our negative impact on the environment. It can predict such phenomena as upcoming floods, alert firefighters about spreading fires, and support diagnosticians in early and accurate detection of cancer. However, giving machines (AI) the ability to decide for example in the vulnerable fields as medicine, education or management... etc., which has always been the responsibility of humans, will be slower in the global scale what proves very sceptical approach of legislatures in the EU or the U.S. as it was mentioned earlier within the article. Moreover, as various researchers predict, IT specialists, automation specialists, electronics engineers, biotechnologists and doctors will still be necessary, even though the changes in the labor market will be profound. But we are still not sure how long yet IT specialists cannot also be replaced totally by artificial intelligence? The intelligent chatbot (ChatGPT, 1-4 models), which premiered in November 2022 and is currently reaching the heights of popularity (in January 2023 alone, it was used 590 million times), answered this question: "Artificial intelligence is not a direct threat to the IT profession". Assuming that CHat GPT is not intentionally lying, let's take this opinion at face value. This is just a main source of generating a current distance and suspiciousness of public opinion and skepticism of specialists towards AI generative technology. There is still endemic fear towards the AI use & applying also in the labour market and market of providing services how to spot the very moment when the AI is becoming independent of humans and makes decisions autonomously. This crucial moment when the AI model replacing human is able to distinct the truth decision from the false is becoming the critical one and according to us will be a breakthrough in approach to AI apply. Bioethics ask weather AI models will be able to make moral decisions as human do, raising such a critical dilemma derives from the conclusion that because AI models in the labour market not only overrun, over power the best employees but also in the same time are able to become effective con artists, liars, cheaters. We didn't raise much attantion in our text on purpuse on the lack of certainty about how artificial intelligence makes decisions, what information it uses, and how objective and fair it is, therefore, we mention about it shortly for the objectivity of our perspective.

#### IV. CONCLUSIONS

To sum up, it is worth pointing out the relational changes within the work organization brought about by the recent digital and post-pandemic acceleration, namely the famous Gartner report from 2020-21 emphasizing the importance of the so-called soft skills and emotional intelligence among not only executives and managers, but all employees striving to be leaders in their profession. The report indicates that 70% of managers are overloaded with responsibilities, and only 16% of medium-sized companies have reduced the number of management responsibilities - moving towards better knowledge, integration, understanding and inclusion of employees



[11]. Relationships between management staff and employees will become 70% asynchronous and horizontal; they will concern analysing products and effects of work after the fact, rather than the production process itself, or direct insight into the provision of work, services... etc. At least one corporation in four will introduce AI technologies by 2025, which will not only replace 69% of the management activities of managers and executives, but will also introduce technologies and applications that will monitor remote/hybrid work; they will be more efficient and effective than management staff, and especially they will be resistant and more effective than humans (fatigue, human errors...), because they are effective 24 hours a day [11]. It seems obvious in these days that technology will change the way in which humans produce goods and run services. Some types of human labor, both physical and intellectual, will be replaced by intelligent programs and robots. Many jobs will be eliminated whilst others will be created. This means that future workers should be prepared to change their jobs and, perhaps, to work for more than one employer at the same time. Let us emphasize again repetitive and routine activities, such as data analysis or manual skills, will be less in demand as they can be performed by robots and the replacement of human work by AI may be complete. However, the importance of the ability to select information and absorb it effectively will increase. In the future, skills such as the ability to communicate with other people and robots, social intelligence, empathy and social perception, i.e. what currently distinguishes people from a programmed machine, will be quite important. It seems that the most desirable combination will be the combination of soft and exact skills. The most sought-after employees will be those whose skills will allow them to translate the language of complex technology and robotization into the language used by an average person, and vice versa. Such people will also cooperate with robots to better understand and understand human behavior.

The presented article pointed only on the main trends and proposals on the changes of labor market in connection with the acceleration of the implementation of AI and robotization after the phenomena of the post-pandemic crisis, certain signs of deglobalization, and still uncertain militarization in certain parts of the world and the loss of the so-called "peace dividends". The reference field of desk research and the chosen reports were the areas of the labor market in the EU, especially in Poland, and comparative phenomena in the USA.

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