



UDC:
005.961:37.091.322.7
005.591.6
 10.58898/sij.v2i1.01-06

RESHAPING THE FUTURE OF WORK: NAVIGATING THE IMPACTS OF LIFELONG LEARNING AND DIGITAL COMPETENCES IN THE ERA OF 5.0 INDUSTRY

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Abstract: Technological advancements and changes in the labor market require workers to continuously enhance their skills. Lifelong learning becomes a necessity in reality, and proposals in developed countries for returning to college after graduation open up new opportunities for acquiring new knowledge. Digital literacy, communication skills with both humans and robots, and understanding complex problems may become key skills for the 21st century. Jobs in the fields of medicine and technological innovation are expected to be in high demand. Furthermore, the digitization of society requires an increase in digital competences. These competences encompass not only computer literacy but also readiness for collaboration, quick problem-solving, and understanding of social relationships in a digital context. The paper "Lifelong Learning and Digital Competences in the Era of Industry 5.0: Keys to Success in the Future of Work" highlights the importance of continuous education and the development of skills necessary in the modern work environment, which is increasingly shifting towards Industry 5.0 and digital transformation.

Keywords: Industry 5.0, work, technology, lifelong learning.

Introduction

The COVID-19 pandemic has had a strong impact on changes in the labor market, and it is questionable whether work and employment will continue in the future in the same way as before the pandemic. However, it is important to note that the pandemic is not the only factor shaping the future of work. Automation and artificial intelligence also play a crucial role in reshaping the mix of occupations, required skills, and transitions that workers face. While the pandemic has brought significant changes in the way we work, it is certain that some of these changes will persist in the post-COVID global society. Flexible work models, such as remote work or hybrid work arrangements, have become increasingly popular and may continue to evolve and be applied in the future. Many organizations have recognized the benefits of these models, such as greater work flexibility, reduced space costs, and increased employee satisfaction.

Automation and artificial intelligence are becoming commonplace in work processes and have a profound impact on the labor market. These technological advancements are changing the way we perform certain jobs and require workers to develop new skills and adapt to changing market demands. While some traditional occupations may be replaced by automation, new occupations will simultaneously emerge that will require understanding and management of this technology. In order for workers to successfully adapt to these changes, continuous learning and acquisition of new skills become vital. Educational institutions, employers, as well as governmental institutions (national governments) must collaborate to ensure access to relevant education and training that will enable workers to adapt to the new demands of the labor market. In addition to technical skills, it is also important to develop skills such as critical thinking, problem-solving, and teamwork, which are necessary for success in the modern work environment. Although the pandemic has created challenges, it has also accelerated some positive changes in the labor market. Organizations have become aware of the need for greater digitization and modernization. New business conditions establish new work rules, but also new approaches to viewing and interpreting business reality. First of all, it refers to a multidisciplinary approach that is based on a

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unified view of several scientific disciplines such as sociology and psychology of work, economic sociology, economic anthropology, behavioral economics, sociology of politics...

Materials and methods

When considering the future of work in Europe, it is important to keep in mind that the old continent is a complex mix of highly diverse local labor markets, which have historically witnessed increasing geographic concentration of employment growth. However, there is a pronounced polarization between dynamic cities and declining regions, creating inequalities in access to job opportunities and economic prospects.

Forty-eight dynamic cities, such as Amsterdam, Copenhagen, London, Madrid, Munich and Paris, where approximately 20% of the European population resides, play a crucial role in generating economic growth. They have been the epicenters of European GDP growth, job creation, and population attraction over the past decade. However, simultaneously, 438 declining regions, mostly located in Eastern and Southern Europe, face challenges such as labor shortages, aging populations, and lower levels of education. This situation further exacerbates regional inequalities and poses new challenges for labor market management.

Unfortunately, the COVID-19 pandemic marked the end of years of strong employment growth and increased social mobility in Europe. The crisis has endangered up to 59 million jobs, which is approximately 26% of the total number of employed people in Europe. This situation has resulted in reduced working hours, wage reductions, temporary layoffs, and permanent job losses. The employment rate has sharply declined, interrupting the growth trend that characterized 85% of European countries before the crisis. This crisis has particularly affected vulnerable groups of workers and regions that were already facing structural issues.

Prior to the pandemic, social mobility was on the rise in Europe. Most migrations occurred within countries, but a significant number of Europeans worked in other European countries. From 2003 to 2018, the number of people who moved to work in another European country doubled, reaching a figure of 16 million. Eastern European countries experienced a significant loss of population as people moved westward in search of better work conditions.

In Europe, after economic recovery, there is expected to be a shortage of skilled workers despite the growing wave of automation. This shortage is primarily due to a decreasing labor force, as Europe's working-age population is expected to decrease by 13.5 million (or 4%) by 2030 due to the aging process. Additionally, the trend of shortened workweeks could further reduce the labor supply by an additional 2%.

Various studies and theories on the pace of automation adoption indicate that by 2030, up to 22% of current job activities could be automated, equivalent to 53 million jobs. However, it is important to note that not all of these jobs will be permanently lost, as new jobs are expected to be created in areas such as technology, tourism, and healthcare. These sectors have the potential for growth and opening up new employment opportunities to compensate for some or even all of the job losses due to automation.

The future of work cannot be discussed without mentioning Industry 5.0, which represents the next step in the evolution of industry. While Industry 4.0 focused on smart technology and automation in manufacturing, Industry 5.0 emphasizes the importance of human involvement in generating ideas and driving change (Teixeira & Tavares-Lehmann, 2023). Its goal is the "rehumanization" of automation and bringing the human factor back into focus.

The concept of Industry 5.0 was first introduced in an article titled "INDUSTRY 5.0 - from virtual to physical," published in 2015, where the author recognized the need for such an approach following the implementation of Industry 4.0. The article highlighted concerns that complete automation would lead to the redundancy of human labor and the dehumanization of work processes (Rada, 2015).

Industry 5.0 advocates for synergy between humans and technology. Instead of being a replaced factor, humans are seen as a critical component in innovation and solving complex problems. Technology is used to support human capabilities rather than replace them. Interaction and collaboration between workers and advanced technologies such as artificial intelligence, automation, and robotics become the foundation for productivity and creativity. Industry 5.0 refers to the collaboration between humans and robots in the work environment, aiming for robots to assist humans in working faster by utilizing advanced technologies like big data analytics (Javaid et al., 2020; Martos et al., 2021).

Technological advancements in automation can lead to changing skill requirements in the labor market. As a result, workers will need to adapt to new skills and areas of work to remain competitive. It is important for educational institutions and employers to recognize these changes and provide educational



programs and upskilling opportunities that enable workers to adapt to the new demands of the labor market.

Additionally, demographic changes and population aging trends require adjustments to labor policies and social protection systems to ensure long-term sustainability and inclusiveness of the labor market. Efforts need to be made to promote active aging, requalification, and transition to new occupations in order to maintain productivity levels and social security in society. Managing these changes in the labor market requires collaboration between government authorities, employers, trade unions, and educational institutions. It is important to establish policies that encourage innovation, entrepreneurship, and adaptation to ensure a secure and prosperous future of work in Europe.

Even with a 4% decline in the total number of jobs by 2030, there would still be a noticeable labor shortage to fill vacant positions. This situation is particularly evident in the mentioned dynamic growth cities. Unless the work-from-home trend, resulting from the COVID pandemic, alters patterns of urbanization, these 48 cities could encompass over 50% of potential job opportunities in Europe in the next decade, intensifying geographical concentration and centralization, trends we have already witnessed in previous decades. In such a scenario, the most likely outcome would be attracting workers from other areas to fill over 2.5 million job vacancies.

When it comes to Serbia, according to the data from the Statistical Office, by 2030, more than half of the population will be 45 years old or older, which presents a specific challenge for economic development and contributes to slower growth. Population aging can have serious consequences for the workforce, productivity, and the sustainability of the economy. In such circumstances, it is crucial to focus on developing policies that stimulate retraining, training, and support for older workers to remain active in the labor market. Additionally, it is important to establish cooperation between educational institutions and employers to ensure a continuous influx of qualified workforce.

To overcome the labor shortage, it is important to invest in the education and training of young people, as well as promote innovation and entrepreneurship. Encouraging links between the academic sector and the business sector, as well as creating a stimulating environment for the development of new technologies and industries, can contribute to attracting and retaining young talents. Furthermore, promoting inclusivity, diversity, and equal opportunities in the workplace is crucial for ensuring a productive and prosperous labor market in the future.

More than half of the workforce in Europe is facing significant changes, in addition to the mentioned labor shortage. Automation will require all workers to acquire new skills to adapt to market changes. Around 94 million workers may not need to change their occupations but will require retraining as technology takes over about 20% of their current activities. While some workers in declining sectors may be able to find similar jobs, it is expected that around 21 million workers will need to change their occupations by 2030.

It is particularly noteworthy that the majority of workers who will require retraining have a medium level of vocational education. This fact is of special significance when considering the educational structure of the population in the Republic of Serbia, as according to the latest population census from 2011, the majority of the population (41.1%) has precisely this level of education. This situation requires taking appropriate measures to properly prepare workers for changes in the labor market. The educational system needs to be adjusted to the needs of the future labor market, and workers should have access to retraining and upskilling programs that enable them to acquire new skills and adapt to new demands.

Moreover, it is important to establish cooperation between educational institutions, employers, and relevant institutions to identify future trends regarding labor market needs and provide support to workers in their transition to new occupations. These changes in skill requirements also present an opportunity for the development of new sectors and industries, and the authorities and the business sector need to work together to promote innovation and support entrepreneurship to create new employment opportunities and foster economic growth.

Social capital will play a crucial role in the future of work, alongside intellectual and human capital. According to the theory of Pierre Bourdieu, social capital is defined as a set of real or imagined resources that are interconnected through institutional or non-institutional relationships and connections. The foundation of social capital lies in the relationships among people, which are based on various motives, with these relationships varying in intensity, quality, and the shared goals or achievements they realize.

In the future, workplaces will increasingly focus on newly acquired skills that are already in demand today. This means that workers will be expected to possess more sophisticated skills to meet the requirements of emerging jobs. In addition to expertise in specific technical areas, workers will need to develop social skills as part of their social capital.

Social skills, such as teamwork, communication, leadership, and adaptability to different situations, are becoming increasingly important in the work environment. Quality relationships with colleagues,



superiors, clients, and other relevant stakeholders become a key factor in workplace success. Creating and maintaining positive and productive work relationships help in developing efficient teams and facilitating the achievement of organizational goals.

Furthermore, social capital can foster innovation and creativity as it creates opportunities for exchanging ideas, collaboration, and joint problem-solving. Openness to different perspectives, the ability to build networks, and support for mutual learning can be crucial factors for success in a dynamic and changing business environment.

In light of these changes, educational institutions and organizations need to recognize the importance of social capital and enhance educational programs to foster the development of social skills among their students and employees. It is also important for individuals to recognize the value of social capital and actively cultivate it through the creation and maintenance of quality interpersonal relationships.

In summary, social capital will be a key factor for success in future work patterns.

The key challenge for the future of work will be addressing labor market mismatches worldwide, with potentially different solutions for each individual community and society. Regarding our country and Europe as a whole, four significant imperatives stand out:

1. Resolving the skills gap (and upskilling): Addressing the shortage of skills and promoting continuous learning and skill development.

2. Improving access to jobs in dynamic growth centers, potentially through increased remote work: Enhancing opportunities for employment in areas experiencing dynamic growth and exploring the potential of remote work.

3. Revitalizing and supporting shrinking labor markets: Providing support and resources to regions where job opportunities are expected to decline, as 40% of Europeans are projected to live in such regions over the next decade.

4. Increasing labor force participation: Encouraging higher workforce participation rates and reducing barriers to employment.

Employers will need to make strategic decisions regarding their workforce, skills, and social responsibility. Their choices should reflect the skills, occupational mix, and geographic footprint of their workforce. Assisting individuals in connecting with new opportunities and preparing for the jobs of tomorrow is a shared task for every region across Europe and likely the world (Nešić Tomašević, 2021).

Industry 5.0 represents a revolution in which humans and machines work together to improve production efficiency (Imoize et al., 2021). Ocicka, Rogowski and Turek suggest that Industry 5.0 is the result of synergy between different industrial technologies, philosophies, and other factors that focus on human factors and technologies in production systems (Ocicka et al., 2022). Also, Industry 5.0 is considered the pinnacle of the smart factory, where communication between robots and humans is achieved. Social networks are used for communication between people and electronic components (Carayannis et al., 2022).

Industry 5.0 introduces concepts focused on human-centric, sustainability, and resilience into the industrial revolution. It will revolutionize production systems worldwide by reducing repetitive tasks performed by humans. Intelligent robots will penetrate production chains and workflows at unprecedented levels (Ietto et al., 2022).

Industry 5.0 aims to promote flexibility, adaptability, and personalization in manufacturing. Through the use of advanced technologies such as 3D printing and the Internet of Things, it is possible to create customized products and services according to individual user needs. This new era of industry also opens doors for the development of new jobs that require interdisciplinary knowledge and skills.

The revolution of Industry 5.0 is primarily about the collaboration between humans and machines to improve industrial production efficiency. Human workers and universal robots enhance productivity in manufacturing industries (Majumdar et al., 2020). The executive teams of manufacturing companies are tasked with defining the production line, monitoring key performance indicators, and ensuring smooth process operations. The future of Industry 5.0 is oriented towards the production of robots and industrial robots. Advances in artificial intelligence and cognitive computing technologies accelerate the manufacturing world and increase operational efficiency. Besides its benefits in manufacturing, Industry 5.0 also contributes to sustainability as it aims to develop a sustainable system that utilizes renewable energy.



Discussions

To embrace Industry 5.0, companies require proper interaction between machines and operators. Knowledge in robotics and artificial intelligence is essential (Zhang & Chen, 2020; Chowdhury, 2020). The role of business organizations lies in decision-making regarding advanced factors. Training employees through virtual education is necessary to reduce costs for companies, as production does not need to be halted for employee training. This type of training provides a safe environment that prevents workers from being exposed to unnecessary risks during the training process. Communication and employee motivation are enhanced through interactive knowledge acquisition environments (Longo et al., 2020; Angelopoulos et al., 2020). Job positions are connected with communication with robot systems and artificial intelligence.

Collaborative robots are designed for intuitive interaction with humans. The development of digital twins is a necessary technology in Industry 5.0. Visual models of products, processes, and generations will enable better understanding and testing. The Nexus Integra platform is the software required to drive the transformation of industrial operations in Industry 5.0 (Nahavandi, 2019). It is an integrated system for managing industrial assets on a large scale, enabling companies to take a step towards digital transformation. Previous generations have adapted to what machines can do (Wang et al., 2020; Deepa et al., 2021). However, Industry 5.0 differs from all previous solutions as humans now have a central role in the manufacturing processes. This new era of industry emphasizes the importance of collaboration between humans and machines, with a focus on efficiency, sustainability, and the development of new technological solutions.

While Industry 5.0 is still in its early stages of development, its potential to transform work and production methods is already being recognized. While technology plays a crucial role, the human factor remains essential for innovation, creativity, and solving complex problems. The rehumanization of work processes through Industry 5.0 opens up new opportunities for workers to engage at a deeper level and realize their full potential. Industry 5.0 is about reintegrating humans and human influence into production and increasing collaboration and connectivity between humans and smart systems for long-term success. It is not against automation but emphasizes the intelligent use of automation, enhancing the roles of both humans and machines. Industry 5.0 states that the future lies in creating a harmonious relationship between humans and machines, enabling them to work better together to build more successful businesses in the long run.

Critics of the Industry 5.0 thesis argue that it is not a technical or developmental continuation of Industry 4.0, let alone a new fifth industrial revolution. Instead, they see it as a practical and relatively inexpensive solution to labor issues in manufacturing, primarily targeting areas where introducing a higher degree of automation is not cost-effective. It helps address product personalization, which is always individual and often requires human creativity and skill. In this context, critics believe that introducing the term Industry 5.0 was overly ambitious, suggesting a new leap forward in society or a continuation of Industry 4.0 (Nikolić, 2018).

Conclusions

At this moment, artificial intelligence has made a huge leap that is actually a new industrial revolution. The consequences of this discovery will certainly be long-lasting and multi-faceted. Dealing with them will not be possible without understanding the social reality. The most important role in the new development belongs to the increase and sharing of knowledge, as well as the personal development of all participants in the work processes.

Lifelong learning has become a necessity in today's world. In some developed countries, there is even consideration of providing vouchers to university graduates after 10 to 15 years, allowing them to return to college and acquire new knowledge. The 21st century brings about the need for new skills that encompass digital literacy, the ability to communicate with both humans and robots through various platforms and technologies, as well as an understanding of multidimensional real-world problems in work processes to analyze risks and ensure safety. For example, jobs as digital mentors require a combination of knowledge about people, society, and technologies.

According to research from the U.S. Bureau of Labor Statistics, the most in-demand jobs in the next 10 to 20 years will be in the fields of medicine and technological innovation. Recently, approaches to economics and business that involve neuroeconomics, neuromarketing, and bioethical scientific advancements are gaining more prominence. The digitalization of society, which reduces personal



contact but simultaneously diminishes personal influence, requires an increase in digital competencies. Digital competencies involve responsible and secure use of digital technologies both in the workplace and leisure time.

However, digital competencies are not solely about computer literacy. They primarily refer to the readiness to collaborate, openness to new things, speed and problem-solving skills, as well as an understanding of the social relations that exist in relation to digital technologies. This new era demands that individuals adapt to changes and actively work on developing their digital skills to be successful and competitive in a world increasingly reliant on technology.

Conflict of interests

The authors declare no conflict of interest.

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