THE LABOUR MARKET AFTER THE IMPACT OF INDUSTRY 4.0 AND THE EDUCATION QUESTION - CURRENT CHANGES IN THE LABOUR MARKET

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Abstract: Abstract Under the influence of digitization, automation and robotization, the way and content of work is changing, similarly to the labour market requirements of an employee performing work in the 4.0 model are also changing. In this paper we discuss the impact of the current technology developments and their impact on the standing of the working man in the near future. Newly created or transformed work positions require certain new knowledge and job skills for future employees, and therefore the current education system plays a primary and very important role in preparing for the labour market. The issue has a societal dimension and is a frequent subject of professional debate at global level, which highlights its current relevance.

Keywords: Keywords industrial revolution, digital transformation, technology, digitization, robotization, education, skills, labour market

1 Introduction

The entire existence is based on an evolution that cannot be stopped. Evolution is permanent, very fast nowadays and modern times offer us new possibilities. The trend of modern times is digitization, automation, robotization and the use of information and communication technologies is constantly on the rise. As Morávek (2018) considered a few years back, "all this is excellent, but at the same time disturbing. Why disturbing? Because it becomes impossible to predict what the world will look like in the relatively near future." We are no longer asking what will happen in ten years' time, but rather what will happen in two or three years' time, because the current development is really unsustainable, it is driving us forward and bringing constantly new trends.

We cannot deny the fact that technical and technological progress has an irreplaceable role for man and thus for society as a whole. Machines and other technical devices, tools and equipment as a result of technical progress, are supposed to help people and to raise their standard of living. In this context, we believe that it is also necessary to ask and address the questions: Is it just about the benefits and advantages of technological progress? Does technological progress also have a dark side?

The attitude of the man - employee towards technology also in the historical context was interestingly discussed by Laclavíková and Olšovská in their study. Before the first industrial revolution, human labour represented a unique and irreplaceable economic good (human labour was crucial in the production process). After the First Industrial Revolution (18th-19th centuries), in which manual production was transformed by energy resources (steam) into factory-machine mass production, the economic importance of human workforce began to be relativized, also in relation to workers' performance. Although human workforce was still needed on assembly lines during the period of the Second Industrial Revolution (late 19th century and first half of the 20th century), the nature of work and the perception of mankind had changed. In order to speed up and increase productivity, there was a push to increase the employee's work output, efficiency and agility were required, which placed physical and mental burden, and this positioned many people in the ranks of the unemployed. As the authors state, "on the one hand, technology has eased the physical workload, but on the other hand, it has also caused negative consequences, mainly in the form of psychological strain or the frustration of monotonous work, and often the loss of an individual value and meaning of the work activity." (Laclavíková and Olšovská, 2018) A better attitude of man, an increase in labour productivity, was to bring about the end of the 20th century the Third Industrial Revolution, which brought the use of electronics and information technology and opened the door to the automation of the production process and its robotization. The current, Fourth Industrial Revolution (early 21st century) is based on the use of information and communication technologies. Digitization and automation, which is linked to the fourth technology revolution, is being applied to production processes, industrial enterprise systems are being interconnected, data is being used more efficiently and new work organisation is being used. Today, industrial society is being transformed into an information society and Industry 4.0. (digital transformation), however, we are already slowly heading towards Industry 5.0, which contributes to technology development. Digital technologies such as artificial intelligence (AI) or robotics are reflected in the fact that workplaces are being radically renovated and industrial workers in particular are expected to see changes in their roles which requires new skills.

2 The consequences of technology innovations for the work of the individual

The world of work is also radically changing as a result of technology developments. In the labour sector, a progressive digital transformation and robotization is visible. Employees use various tools to reduce their workload and improve their working conditions (simpler working tools - inventions - machines - computers). In this ever-expanding digital work, as Barancová (2019) points out, in addition to the Internet, the working tools include robots and machines, which significantly replace the work of the employee. Modern information and communication technologies have simply made the performance of work more flexible, as they have eliminated space and time, which has been reflected in changes in the scope and method of work, and this trend has also brought non-standard working conditions. (Treľová and Procházková, 2020) Overall, we can say that digitization and automation of work processes are emerging, as well as the ways and models of work performance are changing, which, according to Horváth (2021), represents a new challenge in the field of labour law.

Already several years ago, researchers were already thinking about the implications of the use of technology innovations in work activities. As they state, there are mainly 3 scenarios that have been explored when looking at the impacts of technological change:

1. Technology will replace mainly routine manual activities carried out predominantly by human workers (the so-called automation scenario).
2. Technology will change the activities in which human employees increasingly come into contact with modern technologies, thereby increasing human-robot interaction.
3. Technology will replace only parts of certain work activities while maintaining the same amount of work, with even more tasks subsequently being established. (Buhr and Frankenberger, 2016).

Despite the fact that these are different scenarios of the impact of technological progress on the employee's work performance, we are of the opinion that all scenarios are fulfilled, or will be fulfilled, as practice shows us that the second and third scenarios are already relevant today, the third scenario is beginning to be applied (e.g. the work of cleaners is already being replaced by robotic machines in some companies) in the near future, we assume that it will be even more prevalent in the near future.

The impact of technology innovations on human work is undeniable and is the subject of numerous debates as well as various studies, analyses and surveys (e.g. scientific article by Arntz, Gregory and Zierahn, 2020; scientific article by Diebig, Müller and Angerer, 2020; scientific article by Hirsch-Kreinsen, 2016; a survey by the Czech company Grit). Alongside the benefits that exist in the use of new technologies in the labour field - such as newly created more flexible forms of work that

foster innovation, job creation and the growth of a flexible labour market - on the other hand, there are concerns of employees about their jobs. At this point, the question arises: Are these employees' concerns legitimate?

The opinions of experts differ, they are not uniform. Rapid technological progress has its adherents, but also its opponents, who are divided in the debate on whether the increasing use of technology only helps employees to perform their jobs or whether the impact of technology innovation will lead to a reduction in the number of jobs, resulting in an increase in unemployment.

Those who welcome the introduction of technology point to its benefits. The benefits of digitization and automation of work in companies are clearly seen in the simplification and acceleration of work, in easier communication, in the transparency of work, documents and processed data (the use of cloud tools) (No doubt: The survey revealed how digitization makes work easier for companies, 2021) Digitization eliminates the need for many steps and saves time. Hurbanová (2020), for example, sees the positive side of technological change as creating "pressure to bring more humanity or that humanization into the professions, some social and emotional intelligence, to understand yourself, to understand the world around you, other people, that diversity, how to learn how to function intelligently in those social interactions." We also advocate that value-added even in the work field/world will be all about relationships with colleagues, supervisor or subordinates.

On the other side are those who think that too rapid development of technologies and their over-application in practice may also have a negative impact on the labour market. Many job categories (e.g. cashier, receptionist, warehouseman, cleaner, clerk, accountant, waiter, production worker) fear an increase in unemployment precisely because of the emergence of artificial intelligence. We have to clearly state that their fears are justified, because it is expected that robotization will be most evident in the simple job types - mechanical, routine, non-creative activities. "So the higher is the proportion of creative, analytical and interactive elements in the performance of a particular work activity, the less at risk is that job type from artificial intelligence. Naturally, therefore, the defeated workers in the industrial revolution are already those with the lowest skill levels." (Homer a Švec, 2018) However, this does not mean, and it is important to remember, that professions which require more than simple basic skills are also at risk. These include, for example, employees in the health and education sectors. As Matějka and Řehořová (2018) state, "A basic estimate is that up to one-third of current jobs that require a bachelor's degree may in the future be performed by machines equipped with intelligent software." Furthermore, these authors point out that the replacement of catering staff by robots is not foreseen, due to sociological reasons, high entry costs, the concern about the change of atmosphere in the restaurants.

Based on the above, we can conclude that the question of whether a human will be replaced by an artificial intelligence device in a given job position also has a social aspect, while it is essential to take into the account the answer on how would be this replacement (human - robot) seen by the people who are going to be served (customers, students, patients).

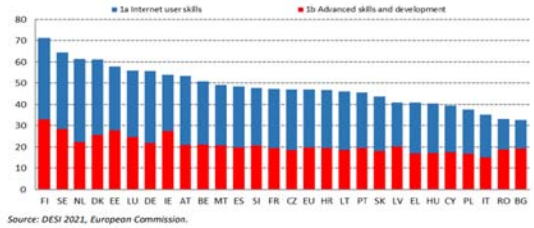
Another aspect in which we see some challenges to the rapid technological change is the level of knowledge of technology use among the population and the issue of education in this area. Although the digitization of work and the use of ICT has potential in the performance of work (flexibility of work, better achievement of work-life balance, strengthening of gender equality, involvement of disadvantaged categories of employees), there are concerns among some employees that they will not be able to adapt to the new working conditions in the near future (even some feel worried today) - they lack the knowledge and skills related to the use of ICT. Although we have been pushed into the use of modern technologies by various, even unexpected, situations, not excluding the pandemic COVID19 (which also forced the performance of work in a non-standard form wherever it was possible and employers as well as employees simply had to adapt), we have to admit that for all employees the rapid transition to teleworking has not been easy, as the use of ICT is not a common for everyone, despite the fact that it is rather expected in the job performance for all age groups.

3 The nature of job positions and skills of employees

The digital transformation is expected to transform many job positions, with some occupations disappearing altogether (robots replacing humans), but also creating entirely new jobs as a result of technology developments and the use of new technologies in work processes. This puts enormous pressure on people in the education sector. Homer and Švec (2018) point out that "all analyses simultaneously agree on the common conclusion that the higher the educational level of an employee, including sufficient work experience and meeting other qualification prerequisites, the directly proportional decrease in his or her eventual replacement by an automated robot." From this we can indicate that persons with higher education and specialisation will have an advantage, the problem will arise for low-skilled and medium-skilled persons who perform semi-automated and simple manual work, which will be replaced by modern technical equipment. As more massive digitization, automation and robotization is (and will be) particularly evident in the manufacturing sector, with a number of jobs being changed or eliminated as a result, a transfer of employees from industry to other areas is to be expected. In the future, the most in demand will clearly be creative occupations with the use of ICT, people studying mathematical and technical sciences (e.g. engineer, technicians and programmers in general, e.g. drone operator, technician of robots used in agriculture, 3D/4D printing engineer, IT specialists), people in professions where communication with people is essential will be in the labour market. Technologically sophisticated professions will play a major role.

In a digital society, digital skills are crucial. As remote working is also expanding and requires the daily use of online tools, basic digital skills are no longer enough for employees. Jobs in digitalised companies will already be filled by employees with advanced digital skills, which means that individuals need to develop their basic digital skills. As we can see from the graph below, the best digital skills (basic and advanced combined) are held by the Finns, followed by the Swedes, the Dutch and the Danes. The Italians, Romanians and Bulgarians have the lowest digital skills and the Bulgarians are the last. As we can see, many countries have the potential to continuously increase the digital skills of their citizens.

Picture 1: Human capital dimension (Score 0-100), 2020



Source: Digital Economy and Society Index (DESI) 2021.

In a digital society, digital skills are key. Although both minimum digital skills (internet users represent 56%) as well as advanced skills are improving in the EU (31% of the EU population, ICT graduates represent 3.8% and ICT specialists represent 4.3%), a large proportion of Europeans still lack at least basic digital skills, even though most jobs require these skills. (Digital Economy and Society Index (DESI) 2021) Here we clearly see not only room for education, but explicitly the need for education and improvement in the field of IT. How to promote, improve, upgrade digital skills? The most effective way is through education. Success can be achieved by

supporting educational activities such as "the provision of training, coaching, courses, lifelong and formal education, requalification and other forms of educational support and training for the development and modernisation of digital skills by both Slovak companies and the state (e.g. retraining for the unemployed)." (Digital Transformation Strategy for Slovakia 2030, 2019)

As the practice shows us, thanks to the progressive introduction of innovative technologies, we are witnessing a step change in the nature of skills. Automation is increasing the demand for both basic and advanced technological skills. "Occupations requiring advanced technological skills include big data scientists, IT professionals, programmers, engineers, technology designers, advanced-technology maintenance workers, and scientific researchers.." (The Rise of Digital Challengers: How digitization can become the next growth of engine for Central and Eastern Europe – Perspective on Slovakia) For future employment, employers need employees with new skills and abilities at even higher levels. The skills of the next decades that need to be developed are:

- orientation in complex situations,
- social intelligence skills and intercultural skills,
- cognitive load management skills,
- innovative and adaptive thinking,
- communication skills,
- transdisciplinary skills,
- design thinking and computational thinking,
- new digital media skills,
- virtual collaboration skills

...that is, the development of those human skills that are difficult for machines to reproduce. (Work 4.0 Digitization Guide; Willyerd and Mistick, 2016) As not only the necessary knowledge, but also the right skills are a prerequisite for access to and success in the labour market, it is necessary to focus on this knowledge and skills required in employment in the current education system.

4 Education as a necessary prerequisite when using technology innovations at work

„All around Europe the structure of employability is changing, the automation of certain tasks and the creation of new roles have formed a significant gap between what employers need and what job seekers are offering.“ (Digital Skills & Jobs Platform) The labour market is already facing a shortage of skilled workers, so there is a need to focus on training people. Occupations that will disappear in the near future and, on the contrary, those that will be established as new ones are being specified, and thereby a forecast is being made of what the labour market will look like in the coming future. This is necessary because these newly created or transformed jobs presuppose certain knowledge and job skills of future employees (not only basic, but also advanced technological and digital skills), which must be gained before people start working in these positions, while individuals should also be able to use these technologies and therefore they have to be familiar with technology itself. On the other hand, we note that it is also necessary to profile the knowledge and skills that will no longer be necessary as new technologies will take the place of people. For example, "Slovak companies are at the same time increasingly demanding a reform of the education system in order to reduce the inconsistency between the skills that graduates learn at school and the skills required by employers." (Digital Economy and Society Index (DESI) 2020 – Slovakia)

Although digitization facilitates the performance of work from the employee's point of view (the possibility of not working directly at the employer's workplace, the possibility of adapting work to one's time, the possibility of a better connection between work and personal life), for the working person there is a need for continuous education, especially in the IT field (the use of digital tools and programs). If the employer uses modern technological working devices, "the employee must accept access to the new working equipment, be able to learn how to work with it, including virtual collaboration with other co-workers of the company. The introduction of new technologies into work processes places extremely demanding requirements on employees in relation to the continuous upgrading of their qualifications in order to be able to carry out their previous work properly, since the content of the work they have carried out so far has changed considerably in terms of qualification requirements over the course of their working lives." (Barancová, 2019) The automation of production, in turn, requires the retraining of employees in order to keep their job positions.

Shortages of skilled labour can be avoided. This brings up an important question - obtaining the necessary qualifications. We think that this requires a systematic change in education, starting at younger ages. It is important to promote the acquisition of the necessary knowledge and practical experience in the use of ICT as early as primary school and to develop it continuously at higher levels of education. Pupils and students will receive a modern and high-quality education if schools at all levels of education (primary, secondary and higher education) teach subjects and disciplines at a sufficient qualitative and quantitative level to provide pupils and students with the necessary advanced digital and technological skills.

The education system must respect the needs of the labour market in the digital age. There is a necessity to change the system, methodology and content of education as “the training of professionals for future professions remains highly specialised and overly sequenced, which inevitably results in a contradiction between the theoretical training of graduates and practical experience, as practice itself requires, above all, a significant deepening of interdisciplinarity and not internal sequencing within a particular discipline or field of study“ (Staněk and Ivanová, 2016)) The emphasis is therefore on interdisciplinary learning, while the practical experience of pupils and students is a very important component. Not only the theoretical training should be emphasised, but employers as well as the actual practice often already require some work-based experience when starting a job on a full-time basis. Work experience and the necessary skills can only be acquired through practice, in which the individual applies the knowledge he or she has acquired, and there are a number of options available. Graduate work experience is one of them. This working experience provides the graduate with professional skills and practical experience with an employer that are relevant to the level of education they have achieved. Graduates can also gain work skills by taking part in an unpaid internship and, if they are interested, can then be offered a regular job by the job provider. In addition to school leavers, who have the opportunity to acquire work skills immediately after graduation, apprentices and students preparing for a career can also gain work experience by taking part in practical training directly with an employer alongside theoretical training. Specific training for young people while they are still studying, in the form of dual training, plays an important role.

In order to provide pupils and students with a real quality education, we do not consider it sufficient to introduce modern innovative subjects (IT) into teaching, but it is also necessary to ensure the education/training of teachers (quality teaching courses) so that they acquire the necessary competences. Barnová and her team appeal that the teacher must know how to apply the technology in the educational process. (Barnová et al, 2021; Barnová, Krásna and Čepelová, 2020)

As for the higher age categories among working people, there is a need for their retraining. This group of employees is struggling more to keep their jobs. These are also people who are slowly approaching retirement age and therefore find it really difficult to find a new job and offer some added value to the employer.

Although the experience they have gathered during their working life is valuable, learning new technological practices and innovations can be challenging for many people.

In view of the above, we believe that it is necessary to prepare for the introduction of new and transformed positions and that the timing plays a very important role. Given the very fast pace of technical innovation, we believe that preparation for future occupations should have started earlier and on a larger scale. Changes in the labour market must be anticipated, education and training must be adapted to these changes (and started well in advance. We are of the opinion that the technological development pace is out of proportion to the changes in the education system, and therefore this area needs to be improved.

5 Conclusion

The last quarter of a century has seen a rapid evolution of technology, and thanks to the continuous improvement of technology, digitalization and automation in companies is also a trend in recent years, and we are just one step away from the expansion of intelligent work. Effective digital transformation requires a straightforward digital agenda.

We are witnessing the labour market changing visibly. Both employers and employees have to face the trend towards digitalisation, automation and, in the near future, the entry of intelligent robots (digital transformation). The latter are realising that they need to change their attitudes and demands if they want to succeed in a competitive environment. Learning and improving the skills needed to do the job is an important foundation. However, we dare to say that today it is not just about future skills, but, given the turbulent developments, it is about the current skills. Quite simply, already „in the world of tomorrow, we must rely on digitally empowered and capable citizens, a digitally skilled workforce and digital experts.“ (Digital Economy and Society Index (DESI) 2021, European Commission)

We are already seeing/noticing problems in the labour market. The growing use of modern technology in the workplace increases the pressure to develop work skills, which also requires a change in the approach to education. As a result of automation, there is a need to retrain employees, but with the emergence of modern jobs, retraining is no longer possible and longer-term training of individuals is required. Here we underline the need to adapt the whole education system to the new challenges, to target this specific education at pupils and students, as well as at people already in work, enabling them to develop new skills for employment. We are of the opinion that reactions to new changes in the labour market should be more flexible and that new changes should be anticipated well in advance and responded to in an appropriate manner. As for the Slovak Republic, already in 2019, Barancová (2019) said that "the education system is not only behind the current needs of manufacturing enterprises, e.g. also the late response in the development of dual education, and the education system of the Slovak Republic is not prepared for the needs of the digital age." The Slovak Republic is aware of the needs for a successful digital transformation of Slovakia, which is why one of the priority areas of the Action Plan for the Digital Transformation of Slovakia 2019-2022 is the digital transformation of schools and education to improve its quality, improve the prerequisites for employment and the acquisition of competences necessary for the digital age. Improving digital skills is also one of the priorities of the Digital Transformation Strategy of Slovakia 2030. (Strategy of digital transformation of Slovakia 2030)

Technology developments are clearly changing the qualification requirements for employees. Positions created by transformation or completely new ones will place greater demands on employees in terms of digitisation and the use of various technical devices. This requires a constant deepening of employees' skills, as well as the necessary retraining of employees, or an increase in their qualifications through studies, as well as a longer-term preparation of young people for the labour market. Only an educated workforce can take advantage of the opportunities of the digital age and investing in lifelong learning for higher qualifications and retraining is necessary. As the use of modern devices affects a wide range of professions and impacts employees of all ages, it is indeed questionable whether most employees are able and competent to adapt to the new conditions and requirements. We think that there are going to be employees who, because of the very specific job, will not be able to obtain the necessary qualifications, and there are also going to be employees who are unwilling to upgrade their existing lower qualifications or to obtain new qualifications, and even employees who are unwilling to undergo the process of upgrading their qualifications over a longer period of time.

In the new labour market, only qualified individuals will be able to use offered opportunities and apply in practice. The issue of adaptation and continuous learning is a prerequisite not only for obtaining but also for keeping a job. If the employee remains passive, this would give the employer the possibility of terminating the employment relationship by giving notice on the grounds of failure to meet the prerequisites for the performance of the agreed work stipulated in the legislation or failure to meet the requirements for the proper performance of the agreed work specified by the employer in an internal company regulation.

We believe that the benefits of a highly modern world of work will divide the labour market into well-paid, highly skilled employees (willing to keep learning) and low-paid, low-skilled employees who can easily find themselves in the unemployed category. As these differences clearly need to be eliminated, we see the perspective really in improving the quality of education and developing the skills of both students and employees who will be prepared for the modern labour market. Only educated and skilled students and employees will be able to respond to the new challenges of the labour market and to accept the technology innovations that will emerge at an increasingly fast pace.

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Primary Paper Section: A

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