

THE ANALYTICAL AND PROGNOSTIC MATERIALS ON THE EXPECTED DEVELOPMENT OF EMPLOYMENT UNTIL THE YEAR 2030+

The Strategic material WORK 4.0

AN ANALYSIS

THE REPUBLIC UNION OF EMPLOYERS IS A MEMBER OF THE FOLLOWING



The Analytical and Prognostic Materials on the Expected Development of Employment until the Year 2030+

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LIST OF ABBREVIATIONS

DESI Digital Economy and Society Index

ESCO European classification of Skills/Competences, Qualifications and Occupations

EU The European Union

ICT Information and communications technology

IoT Internet of Things

ISCP The Labour price information system, quarterly job price statement

MPSVR SR The Ministry of Labour, Social Affairs and Family of the Slovak Republic

MSP Small and medium-sized enterprises

NLP Natural Language Processing

OECD The Organisation for Economic Co-operations and Development)

PIAAC The Programme for the International Assessment of Adult Competencies

SK ISCO-08 The National Classification of Employments

SR The Slovak Republic

STEM Science, Technology, Engineering, Mathematics

PSVR Headquarters Headquarters of work, social affairs, and family

VZPS The Labour Force Sample Survey, The Statistical Office of the Slovak Republic

WEF World Economic Forum

EXECUTIVE SUMMARY

The study "The Analytical and Prognostic Documents to the Expected Development of Employment until the Year 2030+" provides comprehensive analytical and prognostic data for the vision of shaping the labour market in the third decade of the 21st century in the Slovak Republic and the structure of human resources in quantity and quality in the 2030+ horizon.

This is strategic material that can generally be called **Work 4.0**. Developed countries process similar materials, and analytical studies, allocate statistical and prognostic capacities necessary for predicting innovative impacts in the labour market, planning and implementing effective policies leading to the effective development of the labour market in changed conditions.

In order to understand the nature of the changes in the current and forecasting period, it is necessary to realise that this is a process that has taken place in human civilisation and is and will be going on. What has been characteristic in recent decades is the **speed at which these external changes put pressure on the structure of the labour market and on the human resources requirements**. They respond to the quantitative and qualitative change in the demographic development of human civilisation on a global scale. Significantly, social relations between people are changing. This requires at the level of the state, regions, business sphere, and civil society to correct or even radically and significantly comprehensively **change the existing customs, methods, and techniques of human resource management**.

In **formulating innovative trends affecting the labour market** in general, it is necessary to build on the underlying relationships in the labour market. Labour is not a matter, a commodity, or a product in the economy of which cycle. Labour is a purposeful physical and mental human activity and therefore has a human character. Changes in nature, in human activity, in knowledge, as product, process, organisational, political innovations must **positively develop the humanism of human labour**. **This element of innovation is the primary criterion** to be seen and accepted as an axiom in forecasting effective employment.

Through his labour, a person performs an economic activity that is supposed to achieve human well-being. In today's stage of human civilisation, which needs to be monitored under innovative pressures affecting the nature of labour, there are five fundamental factors:

- remuneration for work as the primary source for ensuring personal and community livelihood;
- level of activity at work; an unemployed person loses the chance to apply his knowledge and competencies;
- changing the environment at work allows a person to get to know a new environment;
- Structured time at work gives a person a sense of order and system, effectively creates synergies for the quality of the unique value of work results;
- Social contacts at work make new friends as well as enemies; people differentiate themselves; they face a competitive environment, which creates conditions for intense involvement in social activities;
- The personal identity of an employed person makes sense of solid social identity for a person;

Human resources must be understood even **in the case of forecasted innovation pressures as a reservoir of human potential** capable of creating social products. They are influenced by factors such as formal and informal education processes, including the necessity of further education, factors affecting the population's health status, and cultural and social elements of the life of the community, family,

region, and state. Based on **the triangle "innovation-demography-social relations," the new human resource management model** must respond flexibly to this.

In response to changes in innovative trends of the demographic situation in Slovakia, and the need to set up an addressable family and social policy for building a competitive society, the new model of human resources management must take into account the facts, particularly highlighted in this study, who are mainly (but not exclusively):

- The largest job growth is predicted in industries where new Mind 4.0 technologies increase demand, either directly or indirectly through increased income and wealth;
- The fastest growth can be expected in the field of IT, which will employ 30% more employees in 2030 than at present;
- In 2030, more than a quarter of jobs will be dedicated to specialists;
- the labour market offer will be limited under the conditions of the SR and will adversely affect the further development of the labour market and employment, not only with a view to 2030;
- after obtaining a diploma or degree in the future, 65% of today's children in primary education will take on jobs that don't even exist today;
- In the future, given the limited human resources, there will no longer be deliberations about whether graduates will end up in employment or unemployment but whether we have an adequate labour force structure to ensure further development in key areas and the realisation of the vision of the labour market formation;
- In the SR, there has yet to be a generally accepted vision and strategy to develop human resources in the future, according to which further steps could be taken;
- unless the lifelong learning system responds flexibly to changes, more likely is the scenario in which unemployment caused by technology becomes an increasingly common phenomenon;
- The best and most necessary for our future students leave Slovakia to study abroad - more than half of the 10% of the most successful high school graduates in mathematics in the SR leave to study abroad;
- 330,000 SR citizens live and work abroad for a long time; more than half of them have less than 30 years; a large number of them will never return to SR, and their children will grow up abroad;
- The unfavourable balance of the education structure is when comparing the number of foreigners employed in Slovakia with the number of Slovak citizens emigrating for short-term work; arriving foreigners mostly have only low qualifications;
- The age structure will be more important for the labour market in 2030 than the overall decrease in the amount of the labour force;
- employers will have to adapt processes to the specific needs of older employees;
- there is no comprehensive age-management concept in the SR within the framework of the employment policy for older employees;

- planning the transition to retirement should be part of the overall development of human resources at the employer, as well as part of the managed individual progression of the employee;
- the ageing of the population will manifest itself in full force in the labour market only after 2040;
- the situation will worsen significantly after 2040 when the second strong generation, born between 1975-1980, will begin to retire;
- balancing between the increase in the retirement age, the lack of workers, and the growing economic burden will be one of the most pressing social issues and problems which the SR will face in the next 20 years;
- if there is to be a more fundamental reversal in the development of birth rates, as a precondition for a more even development of labour resources, the society must improve family policy throughout its structure;
- family policy should focus on supporting more even population increases in all layers of society (income, educational, national, ethnic, urban, rural, etc.), without discrimination;
- as part of family policy, it should be a priority for the state to focus on the social conditions of families, to support future mothers to have their first work experience before the first childbirth, and subsequently -for appropriate employment conditions for parents of minor children, especially children under three years of age;
- the current changes in the labour market concerning Industry 4.0 will also require significant changes in the existing legislation of the Labour Code;
- the transformation of existing jobs and the creation of new job tasks will significantly change the demand for skills;
- digital skills are among the key elements of lifelong learning;
- the ability to work with data, find key connections within, to be able to create learning models on top of it, and simply and clearly interpret information will be the dominant skills of the future;
- computer and digital literacy will not be a privilege but a necessity;
- one-third of the EU's active labour force (almost half of the working-age population in the SR) has no or very low level of digital skills;
- digital skills can compensate for the lack of formal higher professional qualifications; however, the opposite does not apply;
- a minimum intermediate level of digital skills will be necessary for the future, but at the same time, more than half of the EU Member States are expected to have advanced digital skills in the period up to the year 2030;
- the digitisation of education is not reaching its potential because schools, teachers, and pupils lack skills and tools;
- fast broadband connection coverage and a very high-capacity network must be improved;

- other main skills/competencies of the future will be creativity and innovativeness and the ability to come up with new ideas;
- along with multidisciplinary and rapid changes, the demand for the ability to learn new things and flexibility will also grow, as well as the ability to work in and lead a team;
- multidisciplinary and general overview will play a key role;
- if specialists in various fields will become more computer-savvy and will, above all, know IT capabilities, it will significantly escalate the company's technological progress;
- according to a survey by Industry4UM and TRIXIMA Bratislava, 74 % of businesses consider Industry 4.0 to be essential for the future, but its implementation slowed down in 2020;
- lifelong learning could become an appropriate way of reskilling and upskilling individuals, as well as preventing skills loss;
- individuals need to learn to anticipate and be more flexible and adaptable to changes;
- in EU-27 countries, a high number of tertiary education graduates aged 25-34 work at a position in a field other than the one they graduated from;
- A suitable tool for ensuring compliance of the required skills with the needs of the labour market can be better informing students about the needs of the labour market through the provision of timely analyses of future developments in the labour market and address information;
- effective cooperation between departments, institutional actors responsible for active labour market policies and lifelong learning systems, representatives of employers, employees, and the territorial self-government is the right way to achieve consistency between the quality of the lifelong learning system and the needs of the labour market;

INTRODUCTION

Current EU policies include three megatrends affecting the labour market in their documents, namely: digital transformation, green transition, and population ageing. However, for the needs of the SR, it is more acceptable to develop modified three megatrends, which can be defined as follows:

- **key technological changes** (including digital transformation and green transition);
- **demographic changes and the labour market development prognoses** (as a quantitative and qualitative element affecting the labour market already in this period and in the forecast period);
- **social changes** (cohesion of civilisational, educational, cultural state of the population in regional terms, including family policy);

These three megatrends interact, support each other, and work together for the better mastering of the processes of change in favour of a sustainable quality of life for the citizens. This must be the objective of a modern, socially, and environmentally developing society. Therefore, the labour market structure should be achieved by changes made through decent work attributes. We can only create the conditions for sustainable growth in citizens' quality of life by performing the changes in such a way. By the premise of the labour market in modern society, **sustainable lasting development in citizens' quality of life must be achieved through decent work**. The fulfilment of this premise should enable mutual, systematic, conceptual mastering of the processes of predicted key changes, such as technological, demographic, and social changes.

The study's nature and content fulfil the employment policy's features until 2030. These are not only measures for the target year 2030 but also a process of successive action changes, creating conditions for a balanced labour market with supply and demand for competitively capable people resources that make optimal conditions for socially and environmentally sustainable development economy. The proposed key priority measures are primarily aimed at supporting the business sector of the SR economy, even if some trends and the resulting changes will also be affected the public administration sector and civil society as a whole.

Analytical and prognostic documents on the expected development of employment in the Slovak Republic until 2030+ mention the main factors that will have an impact on the effective labour market in SR in the next decade. They monitor the predictable effects of the innovation trends and technological changes in the labour market following the development of the fourth industrial revolution, Industry 4.0, the social impacts of these trends, and subsequent necessary changes in the setting of the labour market conditions. Also, new proposals of key measures for the restructuring of the labour market and the assurance of Slovakia's competitive economy in the next decade's dynamically changing environment are being presented.

CHAPTER 1

Key innovation trends affecting the labour market in the vision until the year 2030+

1. KEY INNOVATION TRENDS AFFECTING THE LABOUR MARKET IN THE VISION UNTIL THE YEAR 2023+

The technological revolution brings significant changes to the labour market worldwide. Some jobs disappear, work procedures change significantly, and new professions are created related to the shift in requirements for labour force qualification, professional knowledge, professional skills, and especially competencies. Knowing how job profiles change depending on the level of automation, digitisation, robotisation, or other technological trends brings design and implementation possibilities. Such measures can adapt the labour force to intense restructuring pressures in the labour market. Therefore, the study's first component is identifying key innovation trends affecting the current labour market and the 2030+ horizon.

Key trends updated according to the outlook of Industry 4.0 and knowledge of the impacts of the COVID-19 pandemic into a study intended as an expert input into the broad public debate about long-term national priorities for 2030 by **the Institute for Forecasting - SAV**¹. Challenges and key trends are divided into five priority topics:

- Sustainable economic growth in an ageing population and a changing global environment;
- Education for sustainable development (inclusive and quality education for the needs of the labour market);
- Health and quality of life;
- Sustainable settlements and landscape in the context of climate change;
- Elimination of poverty and social inclusion

Similarly, the SK RIS3 2021+² strategy update is underway in 2021. Its strategic vision is to ensure and implement an economic transformation that will bring economic growth by 2027 based on research and innovation. It will also create knowledge-intensive products and jobs with high-added value. The redefined domains are:

- An innovative industry for the 21st century;
- Mobility for the 21st century;
- Digital transformation of Slovakia;
- A healthy society;
- Healthy food and environment

The Ministry of Investment, Regional Development, and Informatisation of the Slovak Republic also developed a **Vision and development strategy of Slovakia 2030, -a long-term strategy for sustainable development of the Slovak Republic - Slovakia 2030**³, which is the primary implementation document

¹ Starting points for the preparation of national priorities for the implementation of 2030 Agenda, The Institute of Forecast SAS, 2017, https://www.researchgate.net/publication/322490851_Vychodiska_pripravy_narodnych_priorit_implementationie_Agenda_2030

² <https://www.mirri.gov.sk/sekcie/investicie/strategia-vyskumu-a-inovacii-pre-inteligentnu-specializaciu-sr/aktualizacia-ris3/index.html>

³ Vision and development strategy of Slovakia 2030 - a long-term strategy for sustainable development of the Slovak Republic – Slovakia 2030, the MIRRI, 2020 <https://www.mirri.gov.sk/wp-content/uploads/2021/01/Slovensko-2030.pdf>

for fulfilling the national priorities of the 2030 Agenda for Sustainable Development. Emphasised labour market priorities include:

- To stop the decline of the population and support the growth of the share of the economically active population;
- To improve the availability and quality of education and training of the population and harmonise them with expectations by labour market demand;
- To improve the health status and length of active life of the population;
- To support the development of strong innovation-based regional economies;
- To complete the infrastructure of an innovation-based green economy;
- To improve the sustainability and resilience of national and regional economies;
- To improve accessibility, transparency, and efficiency of public administration;
- To strengthen the economic sustainability of the communities of municipalities, cities, and regions;

Economic Trends

Under the influence of the knowledge and impacts of the COVID-19 pandemic and the urgent manifestations of the fourth industrial revolution, the whole world and, therefore, the UN, the OECD, the European Union, and national states updated at the turn of the year 2020 and 2021 their plans for The 2030 Agenda for Sustainable Development.

The global economic recovery from the Covid-19 pandemic remains very uneven, with some economies trying to return to pre-pandemic production levels. **Governments will try to cope with the enormous deficits** resulting from the economic stimulus introduced during the pandemic.

A declining working-age population, uncertain prospects for trade and investment, and a declining rate of productivity growth will make it difficult to generate long-term economic growth.

Slower growth in advanced economies

Despite a slight recovery in recent years, economic growth is much lower in almost all of the world's developed economies during the first two decades of the 21st century than in the entire second half of the 20th century. Since 2000, advanced economies have grown by just under 2% per year. Opening a global economy resulted in a severe loss of competitiveness in most developed economies, especially those that are weak in high-tech and high-growth sectors of the economy.

Integrating many emerging markets into the global economy in the 1980s and 1990s led to a dramatic transfer of economic power to emerging markets in the 21st century. This shift in production led to rising wages in many emerging markets, allowing them to create their own consumer market, thereby increasing their own level of economic development.

Labour shortage

In most of the largest economies in the world, the working-age population is either stagnating or already declining. In many areas of Europe, including Slovakia, birth rates have been or are dramatically low, leading to today's labour shortages. Falling birth rates lead to a lower growth rate of the working-age population and a reduction in the unemployment rate. **Without available labour, businesses are forced to become more automated to maintain their own productivity;** this trend could dominate many sectors of the economy in the following years.

Silver Economy

The working-age population worldwide is stagnant or declining; the world's older population is growing rapidly, providing the surest growth market for companies and investors. The countries with over 20% of the population over 65 today include large economies such as Japan, Italy, Germany, and France. **By 2050, there will be almost 1.6 billion people over the age of 65 in the world,** which is the opposite today, an increase of 900 million. As this market will be guaranteed for years and decades to come to grow, businesses will undoubtedly develop new goods and services to meet the demands of this segment market.

Growing Debt

One of the dominant economic issues of the 21st century so far has been debt. In fact, it was debt in both the public and private sectors that led to and exacerbated the global financial crisis that began at the end of 2007. Since the financial crisis, most major economies have taken significant steps to get debt under control. A new threat comes from private sector debt held by banks, businesses, and consumers because, in many cases, this type of debt is still growing in many countries at dangerous heights.

Environment

Of all the problems that have affected the global economy to date, none have had this potential, such as environmental changes. It is possible to watch the rise of entirely new industries thanks to the changing climate and concerns about the consequences for the future of humanity. Concerns prevail that the changing climate could be accompanied by large-scale economic shutdowns, some of which could destroy the global economy. In the next decade of the 21st century, it will be important to monitor how the developed economies balance out with slowing economic growth, productivity-enhancing trends, the follow-up of technological trends, and climate change while respecting the conventions of the Green Deal.

Technological trends

The pace of technological change continues to accelerate, which has a major impact on the economy in this century. In fact, we are currently in the midst of a race for technological supremacy between companies and between countries. The nearest future of work in the conditions of Industry 4.0 (Work 4.0) is primarily in Slovakia's readiness for the Digital Economy in 2030 horizon when information and communication technologies (ICT) or digital technologies within a separate sector of the economy will create promising job opportunities with high added value; however, information and communication technologies will penetrate into all other industries in which skills for the use of ICT (digital skills) will be an obvious requirement. International recommendations in the field of the digital economy can be found in Annex No. 1.

According to entrepreneur and futurist Peter Diamandis, we will experience more progress in the next

decade than in the last 100 years as technologies transform health and materials science, energy, transport, and many other industries.

The identification of technological trends is based on the analysis of McKinsey & Company⁴.

The consulting company McKinsey & Company has identified trends that will allow solving significant problems of humanity:

- **Applied artificial intelligence** (computer vision, natural language processing of NLP, speech recognition technology) Artificial intelligence will enable new applications (e.g., faster development cycles and detailed reports about customers), eliminates work on recurring tasks (e.g., archiving, preparation documents, and indexing), and will support global access to highly specialised services and talent (e.g., improved telemedicine and the ability of specialised engineers and technicians work in dangerous environments from safety).
- **New generation computers** (quantum computers, neural chips, application customer circuits), e.g., simulation at the molecular level, reducing the empirical knowledge and testing required for a number of applications leading to innovations in the industry, such as new materials, chemicals, and pharmaceuticals; also highly personalised product development, e.g., in medicine; ability break most cryptographic security algorithms, disrupting current approaches to cyber security; and faster diffusion of autonomous vehicles.
- **Trustworthy Architecture** (security based on a zero-trust model, blockchain) The trust architecture helps commercial entities and individuals to create trust and conduct business without the need for intermediaries, even when zero-trust security measures address growing cyberattacks; countries and regulators will likely need to review regulatory oversight; technology distributed ledger will reduce costs and enable transformational business models).
- **Distributed infrastructure** (cloud and edge computing) The wide availability of IT infrastructure and services through cloud computing could shift the demand for local IT infrastructure and reduce the need for IT set-up and maintenance, while democratisation of the infrastructure will help shift the competitive advantage from IT infrastructure to software and talent development.
- **Future connectivity** (5G and IoT connectivity) With high-speed or low-band 5G connectivity, reaching up to 80 % of the world's population by 2030, better coverage and connectivity speeds over long and short distances will allow new services (e.g., remote patient monitoring), business models (e.g., connected services) and next-generation customer experiences (e.g., live virtual reality).
- **Future programming** (Software 2.0 - the creation of software based on the use of deep neural networks) Software 2.0 creates new ways of writing code/building software and reduces the complexity of this work; companies will have to master the procedures and technologies of DataOps (Data Operations) and StrUčOps (Machine Learning Operations) to make the most of the future of programming.
- **New level automation** (industrial Internet of Things, robots, cobots, RPA) Self-learning, reconfigurable robots will lead to the automation of physical processes over the framework of

⁴ The top trends in tech and Accenture's Technology Vision 2020 and 2021

<https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-top-trends-in-tech>

normal activities and will also include less routine activities, leading to the fact that fewer and fewer people will work in the activities, leading to the restructuring of the labour force.

- **Virtualisation of new-level processes** (digital twin, 3D, 4D printing) Advanced simulations and 3D/4D printing will virtualise and dematerialise processes, shorten development cycles in the context of faster, shortened product life cycles, increase profitability, and accelerate strategic and operational procedures.
- **Bio revolution** (Biomolecules, Biomics, Biomachines, biocomputers, augmentation) "Genomics" enables rapid analysis of genetic materials and opens up possibilities, e.g., for fast vaccine development, personalised medicine, and gene therapy. Using biological material such as an "information carrier" through computer processing can extend data storage using DNA as an information medium.
- **Clean technologies in the future** (nuclear fusion, smart distribution/metering, batteries/battery storage, carbon neutral energy) Clean technologies are becoming cost-effective, increasingly disrupting traditional business models, creating new business-building opportunities, operational improvement programmes driven by clean technologies, and new climate change requirements that can change the balance of carbon-intensive sectors.
- **New generation materials** (nanomaterials, graphene and 2D materials, molybdenum disulfide nanoparticles) Next-generation materials can transform the economy of industry and reconfigure companies in it (e.g., by enabling the integration of sustainable materials and renewable energy sources into processes), including as material innovation. Science helps to create smart materials with programmable properties that respond to the stimuli of external factors.

Table 1 Technological trends and their impact on the sectors of economy

		Health	Automotive	Electrical engineering	ICT sector
	Next Level Process Automation				
	New generation materials				
	Applied Artificial Intelligence				
	Clean technologies				
	Future connectivity				
	The bio revolution				

		Health	Automotive	Electrical engineering	ICT sector
	Next Generation Computers				
	Trustworthy architecture				
	Distributed infrastructure				
	Future programming				

	Significant impact
	Moderate impact
	Limited impact

Source: McKinsey Global Institute, 2021

Technology trends will affect markets and sectors in a few decades

Table 2 The impact of technological trends on markets and sectors

Trend	Impact
Next-generation automation and virtualisation	50 % of current work activities can be automated by 2025
The Connectivity of the Next Generation	up to 80 % of the global population will be covered by 5G by 2030.
Distributed infrastructure	more than 75 % of business-generated data will be processed in the cloud and at the border after 2025
Next Generation Computers	\$1 trillion of the potential value of quantum computing will be realised after 2035
Applied Artificial Intelligence	more than 75 % of all digital service contact points (e.g. voice assistants) will see improved usability, enriched personalisation and increased conversion
Programming of the next generation	more than 30 times the working time needed for software development and analysis
Trustworthy architecture	more than 10 % of global GDP could be linked to blockchain by 2027
The bio revolution	45-fold reduction in human genome sequencing costs has been achieved in the last 10 years
New generation materials	10-fold increase in the number of patents between 2008 and 2018
Clean technology in the future	more than 75 % of the world's energy will be produced from renewable sources in 2050

Automation and replacement of the human labour force is not a new phenomenon

In modern times, automation processes already began during the industrial revolution. However, the perception of these processes' consequences has changed significantly with Industry 4.0. In the past, automation caused an increase in unemployment to a greater extent. In the current era of digitisation, it may be different. Analyses show that with the economy's growth, new job opportunities will be created for those who lost their previous job. Overall, technological progress did not cause the demise of the more significant number of jobs as it made them but significantly changed the skill requirements of the labour force.

The impact of technological and digital development on employment has changed recently. Over the past few decades, rapid technological advances have made information communication products cheaper, so much so that they have become more economically attractive than human labour.

From a technological point of view, recent innovations make it possible to replace more and more types of work. A lot of experts expect this trend to continue or even accelerate. In extreme cases, it will be possible to replace up to half of the current human labour force with digitised technology over the next 20 years. **It is true that the faster technology advances, the harder it will be for the labour force to adapt to changes.** Consequently, it cannot be accepted that technological development creates at least as many jobs as it eliminates.



A more likely is a scenario in which unemployment caused by technology becomes an increasingly common phenomenon unless the lifelong learning system reacts flexibly to changes.

Based on the experience of previous industrial revolutions, it is safe to say that the structural change in the labour force caused by Industry 4.0 is inevitable. Every industrial revolution brought about an increase in efficiency and productivity. With the latest technological advancements, automation solutions are getting cheaper and better. They are pushing the human labour force out of an increasing number of jobs, which may lead to a phenomenon introduced by English economist John Maynard Keynes known as “**technological unemployment.**” This theory says that technological progress will replace human progress jobs faster than new ones can be created. **Today it is possible to automate 50% of all tasks related to the impact of technology.** There are only a few jobs (less than 5%) that consist of tasks that cannot be automated at all. It is assumed that technology replaces up to one-third of tasks in 60% of jobs. **The range of tasks that could potentially be automated is gradually expanding and increasingly includes tasks that cannot be easily classified,** such as information retrieval, pattern recognition, or forecasting. Devices supporting artificial intelligence have adopted the ability to learn and improve based on previous experience, so they perform a wide range of tasks without being explicitly programmed for this purpose. This is done thanks to machine learning and the ever-expanding collection of data from all areas of life.

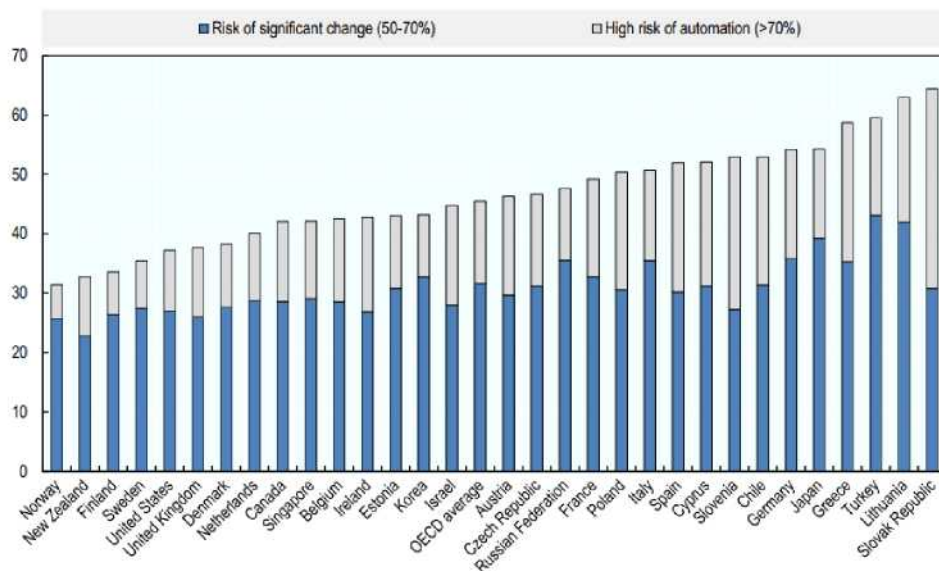
Several studies have attempted to estimate the number of current jobs that could be automated in light of the ongoing technological progress in the future. **As a first step, these studies assess the technical feasibility of automating existing tasks and, on this basis, estimate how many tasks within a given job can be automated in the future.**

Sectoral and regional differences in structural changes in the labour force

Differences in industry and occupational structures are often cited as the leading cause of disparity related to the predisposition of jobs to automation within countries and regions. For example, if manufacturing is subject to automation to a greater extent than services, countries with larger shares of manufacturing employment show a higher average susceptibility to automation. However, most of the differences between countries are explained by differences in the distribution of occupations within the economic sectors and how tasks within the same professions are conceived. This means that, depending on how the work is organised, a given job may be more likely to be automated than others in some countries or regions.

Based on the estimation of the prevalence of jobs where tasks are much easier to replace with new technologies, the potential risk that different geographical areas will face in terms of automation of work in the future can be compared. The latest edition of OECD Regional Outlook (2019) points out that the incidence of jobs at risk of automation is in a sample of Eastern European countries (Slovakia, Slovenia, Poland) and Southern Europe (Greece, Spain) much higher than the OECD average, while in the Nordic countries and the United Kingdom, this risk is significantly lower⁵.

Graph 1 Differences in job automation by country and % jobs risk share



Source: OECD, 2017⁶

From the analysis of differences at the regional level, it is clear that there is a significant difference in some countries between capital regions and the rest of the territory. This is especially the case in

⁵ The Future of Skills Employment in 2030, Pearson, Nesta, Oxford Martin School, 2017, <https://futureskills.pearson.com/research/assets/pdfs/technical-report.pdf>

⁶ Automation, Skills Use and Training, OECD, 2017, https://www.oecd-ilibrary.org/employment/automation-skills-use-and-training_2e2f4eea-en

Slovakia, France, and the Czech Republic, although the same happens in most other countries. This trend can be explained by the relatively higher share of high-paid jobs in capital cities. The higher potential of these regions to attract investment and human capital from other areas can also play a role.

The possibility of real automation of work depends on a number of interrelated factors that extend far beyond the mere technical feasibility of automation. Forecasting the potential of work automation requires the most accurate estimates of future demand for goods and services, organisation of production processes, intensity of introduction of technologies, cultural and institutional factors, and changes in consumer preferences.

The change of the work content as a result of digitalisation

Digital technologies determine not only the disappearance or creation of jobs but also the change of what people do at work and how they do it, which shapes the content and methods of work. Job profiles would be substantially changed by adding new tasks or modifying the existing ones. This change would require the adaptation of workers to new jobs, work organisation, and work tools. Technological transformations contribute to changes in tasks that are part of work cities. Eurostat figures show that in 21% of people whose work involved using any computer, portable device, or other computer technology, the main tasks due to introducing new software or computer equipment have changed.

Using computers in the workplace has encouraged a shift in employment towards jobs with less routine and more social tasks. Over the past 20 years, compared to other jobs, sometimes they expanded those that include more social types of tasks, i.e., j. those whose primary objective is direct interaction with other people.

Workers are generally required to cope with complex production processes with instability at work; they contribute with their own creativity and cooperate with others. All these aspects of jobs require key attributes of human labour, such as independence and sociability, which are above the current possibilities of advanced machines equipped with artificial intelligence. **If the work is organised in an addressable, standardised, and predictable way, automation of tasks becomes much more likely.**

Several prognostic analyses indicate that the positive effects of the introduction of technologies on creating jobs compensate for the disruption of jobs associated with automation.

In industry, automation affects indirect employment growth in consumer industries, and it increases aggregate demand, which ultimately leads to net employment growth.

In the upcoming decade, employment growth will likely be concentrated at both ends of the occupational ranking. Occupations expected to grow in most EU-27 countries by 2030 seem to require higher education with a close focus on social and interpretative tasks, with at least basic ICT skills needed. However, employment in simple manual occupations is also expected to increase, while employment involving skilled manual tasks is expected to decrease.



Jobs involving administration and processing a large amount of data will also be in high demand.

As economies and technologies become increasingly data-driven, job opportunities will need to expand for experts in the field of data collection, processing, analysis, and interpretation.

New job positions may not have the same characteristics or arise in the same industries and places as "original job positions" that will disappear. Although, in the end, technological change has a positive effect on net employment, **the transformation of existing workplaces and the emergence of new work tasks will significantly change the demand for skills.** To fully utilize and share equally in the potential benefits of technological progress is increasingly essential to anticipate and respond to emerging skills needs.

The skills required by employers are changing depending on how digital technologies transform the content of the work. Automation leads to the transformation of the very nature of the great a number of professions.

Digital technologies cannot replace those jobs that require "the simultaneous use of a wide range of skills and solutions to unforeseen scenarios" (Harari, 2018). **In this sense, in addition to reading and numeracy literacy, accessible jobs require more unique skills** (World Economic Forum, 2020⁷). In the next decade, it is expected that technological changes will cause a decrease in the importance of physical tasks and an increase the importance of cognitive and social tasks, digital tools, independence, and teamwork (Cedefop, 2018). **Therefore, it is necessary to expect a greater demand for digital and non-cognitive competencies.**

The EU labour market demands more non-cognitive and digital skills, especially their combination. Almost all professions that have expanded in recent years, such as engineers or service and business managers, require various ICT use and non-cognitive skills (for example, used in dealing with customers and work teams).

However, on average, occupations that work require low digital skills and/or poor social and emotional interaction abilities have decreased. Although digital technologies have also changed the quality of managers' work care services, they had only the minimum for the daily work of professional caregivers' impact. **Although digital technologies have yet to fully penetrate this sector, required caregivers' digital skills have increased.** This also indicates the growing importance of **acquiring basic digital skills within this group of workers.**

In the future, most jobs are expected to require medium digital skills and strong non-cognitive skills. As technology-driven production processes become more complex and interconnected, workers are increasingly expected to organise and coordinate these processes, often using digital tools. The OECD (2018) study states that in order to cope with the unknown and variable circumstances that best characterise the expected working environment in the future, jobs will require workers to be equipped with different skills: cognitive and metacognitive skills (such as critical thinking, creative thinking, the ability to learn and self-regulation); non-cognitive skills (e.g., empathy and collaboration) and digital skills (e.g., use of new digital devices).



One third of the EU's active labour force has no or very low levels digital skills.

European employers show that a large proportion of workers are unprepared to respond to the growing demand for digital skills⁸. **Digital skills can compensate for the lack of formal higher education qualifications, but the opposite does not apply.**



At least an intermediate level of digital skills will be necessary in the future. Still, at the same

⁷ <https://www.weforum.org/reports/the-future-of-jobs-report-2020/in-full/infographics-e4e69e4de7>;figure in annexes

⁸ Curtarelli a kol., 2017; Servoz, 2019

time, more than half of the EU Member States are expected to have advanced digital skills mismatches in the period up to 2030.

In 2018, 53% of companies had difficulties filling vacancies for professionals in the field of ICT (DESI, 2019). It is expected that despite the positive developments in recent years, **the gap between the demand and supply of ICT professionals will continue to widen in the EU**. Due to the growing use of digital technologies in crucial sectors, such as transport, energy, healthcare, and finance, Europe can expect a shortage of qualified professionals to help address new digital trends, such as the growing number of cyber-security attacks.

Developing non-cognitive skills is increasingly important for the success of individuals in the labour market. Wage heterogeneity, especially among highly skilled workers, increasingly depends on individual characteristics related to non-cognitive skills, which are currently not fully covered by formal education. According to Aoun (2017), individuals should devote themselves to the development of non-cognitive skills to be able to respond to the demand of the labour market in a digitised world, as well as to increase technological and data literacy. The author considers **creativity, innovation, entrepreneurship, empathy, and teamwork essential to make people “robot-proof.”**



Individuals must learn to anticipate the changes and be more flexible and adaptable to them.

This wave of automation, which brings further robotisation of routine tasks, will make it difficult for people with low qualifications to search for employment without prior requalification or skill level enhancement (Harari, 2018). Although it is difficult to predict what competencies will be required in the future, citizens must acquire adaptive skills in addition to knowledge. **Despite its effectiveness, teaching non-cognitive skills is not covered as a key area across the EU. However, introducing social and emotional learning as a key area of the curriculum and as a cross-cutting interarticular theme aimed at developing students’ non-cognitive skills can be strongly recommended.**

The share of young workers not working in the field they graduated from is increasing (horizontal mismatch). **A high share of tertiary education graduates aged between 25-34 are employed in EU-27 countries, working in a position in a field other than the one they graduated from.** The occurrence of horizontal mismatch is highest in the humanities and has also increased in the technical sciences over the past three years.

A horizontal mismatch may indicate that people are not equipped with the required skills in the labour market. This may be due partly to personal choice and the fact that educational systems may not respond sufficiently to emerging skills needs (OECD, 2019a). **One of the ways to ensure compliance of the required skills with the needs of the labour market could be better informing students about the needs of the labour market by providing timely analyses of future developments in the labour market and more relevant information** (e.g., employment overview, monitoring application of graduates). In the case of the SR, effective tools appear to be publicly available websites: <http://www.uplatnenie.sk/> and <https://www.trendyprace.sk/sk>.



Lifelong learning could become an appropriate way of reskilling and upskilling individuals, as well as preventing skills loss.

Lifelong learning is learning that takes place in different contexts throughout life. It occurs not only in formal education at schools and universities but also through informal learning and non-formal education. The EU's response is to provide tools for recognising the results of non-formal education and informal learning, e.g., the European inventory for validating non-formal education and informal learning (Cedefop a coll., 2017). In the EU-28, only 11.1 % of adults aged 25-64 participated in lifelong learning in 2018. Furthermore, in 2018, only 7 EU Member States achieved the Europe 2020 target (15 % of adults aged 25-64 were expected to participate in lifelong learning by 2020).

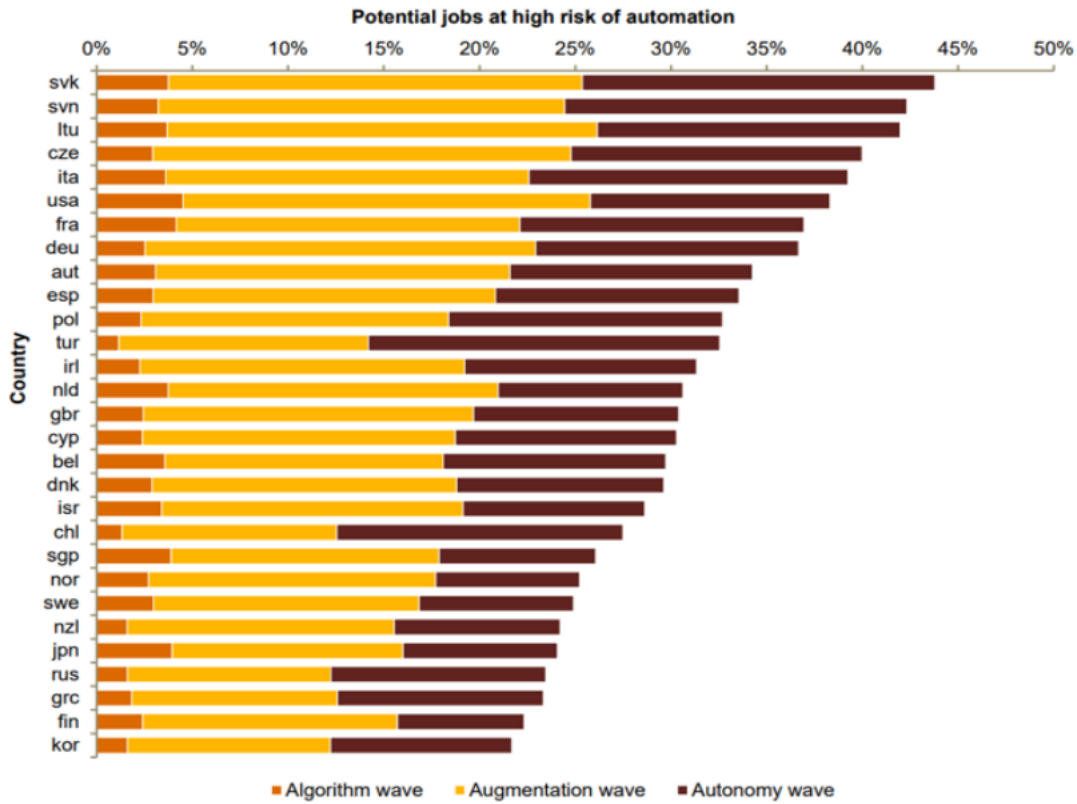
The document "Will robots really steal our jobs" (PwC, 2019) provides a comprehensive and detailed analysis of a dataset compiled by the OECD that deals in detail with employment-related tasks of more than 200,000 workers in 29 countries (27 from OECD countries and from Singapore and Russia). Based on previous research by Frey and Osborne (Oxford University, 2013) and Arntz, Gregory, and Zierahna (OECD, 2016), the share of existing jobs that could represent a high risk of automation by 2030 was estimated.

This process may develop until 2030 in three overlapping waves:

Algorithmic wave	Focused on automating simple computational tasks and analysis of structured data in areas such as finance, information, and communication. This wave is already underway.
Augmentation wave	Focused on automating repeatable tasks such as filling in forms, communication, and dynamic exchange of information in the administration, through technological support, a statistical analysis of unstructured data in semi-controlled environments such as drones and robots in warehouses. This wave is partially ongoing today but is expected to be the largest after 2021.
Autonomous wave	Focusing on automation of physical work and manual skills and problem-solving in real-world dynamic situations requiring reverse action, for example, in manufacturing and transportation (e.g., driverless autonomous vehicles). These technologies are already being developed but are expected to be fully exploited on an economic scale only in the 2030s.

The estimates are primarily based on the technical feasibility of automation, so the actual scope of automation may be narrower due to various economic, legal, regulatory, and organisational constraints. Just because something can theoretically be automated doesn't mean it will be economically or politically viable in practice.

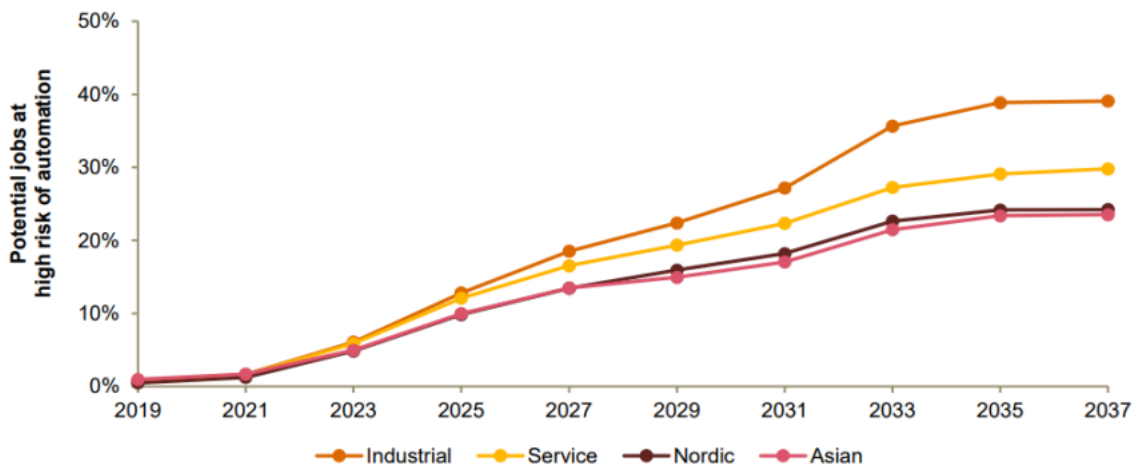
Graph 2 Potential labour automation rates by country in different waves



Source: PIAAC data, PwC analysis 2019

The potential impact of automation, caused by the cumulative impact of the above three waves over time, shows the following graph according to the economy's orientation.

Graph 3 Potential jobs at high risk of automation



Source: PIAAC data, PwC analysis 2019

Table 3 The estimate of the evolution of the share of jobs at risk of automation in countries during three waves of automation

Country	Algorithm wave (%)	Augmentation wave (%)	Autonomy wave (%)
Slovakia	4	25	44
Slovenia	3	24	42
Lithuania	4	26	42
Czech Republic	3	25	40
Italy	4	23	39
USA	5	26	38
France	4	22	37
Germany	3	23	37
Austria	3	22	34
Spain	3	21	34
Poland	2	18	33
Turkey	1	14	33
Ireland	2	19	31
Netherlands	4	21	31
UK	2	20	30
Cyprus	2	19	30
Belgium	4	18	30
Denmark	3	19	30

Source: PwC, 2018⁹

Regarding employment structure, Slovakia will be most affected by the wave of augmentation and wave autonomy. However, it is important to keep in mind that various economic, legal, regulatory, and organisational constraints may cause automation not to happen as quickly as expected.

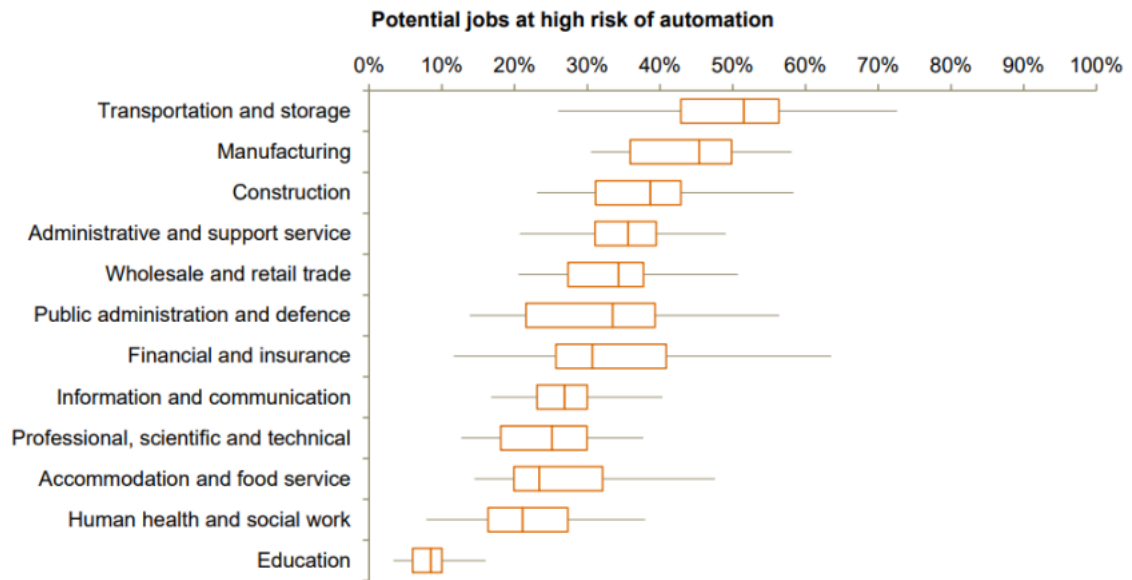
On the other hand, new technologies such as **artificial intelligence and robotics will create many new jobs**. Some of the new jobs will be directly related to the listed new technologies, but most of them will only result from general increases in productivity, incomes, and wealth that these technologies will bring. As additional revenue is spent again, it will create additional labour demand and, therefore, also new jobs.

The greatest impact of automation will be felt in the manufacturing sector (with an estimated automation of 45%); the wholesale and retail sector also has a high estimate of automation at the level of 34% (with a median employment share of 14%), while health and social work has a relatively lower potential for automation at the level of 21% (with a median share employment 11%).

⁹ Will Robots Really Steal Our Jobs?, PwC, 2018

https://www.pwc.com/hu/hu/kiadvanyok/assets/pdf/impact_of_automation_on_jobs.pdf

Graph 4 Potential jobs with a high level of automation



Source: PIAAC data, PwC analysis 2019

Jobs with a high level of threat due to automation

The fact that the level of automation varies from country to country in a given sector is illustrated in more detail in the table below for the five largest sectors by employment of the given country.

Table 4 The expected level of automation in selected sectors (colour spectrum from red to green indicates sectors with high automation (red spectrum) to sectors with low automation (green spectrum))

Country	Manufacturing (%)	Wholesale and retail trade (%)	Human health and social work (%)	Education (%)	Construction (%)
Slovakia	58	43	34	14	42
Slovenia	57	35	31	13	53
Lithuania	55	39	27	26	58
Czech Republic	55	33	38	10	36
Italy	55	35	29	17	44
USA	53	51	28	12	34
France	53	41	29	17	41
Germany	49	43	24	9	39
Austria	48	37	26	9	51
Spain	45	35	26	8	42
Poland	50	31	21	9	48
Turkey	45	26	36	8	40
Ireland	50	39	17	7	33
Netherlands	46	35	24	8	36
UK	45	42	18	8	23
Cyprus	38	35	14	6	42
Belgium	45	28	19	10	43
Denmark	46	33	17	9	44
Israel	42	34	14	8	42

Source: PwC, 2021¹⁰

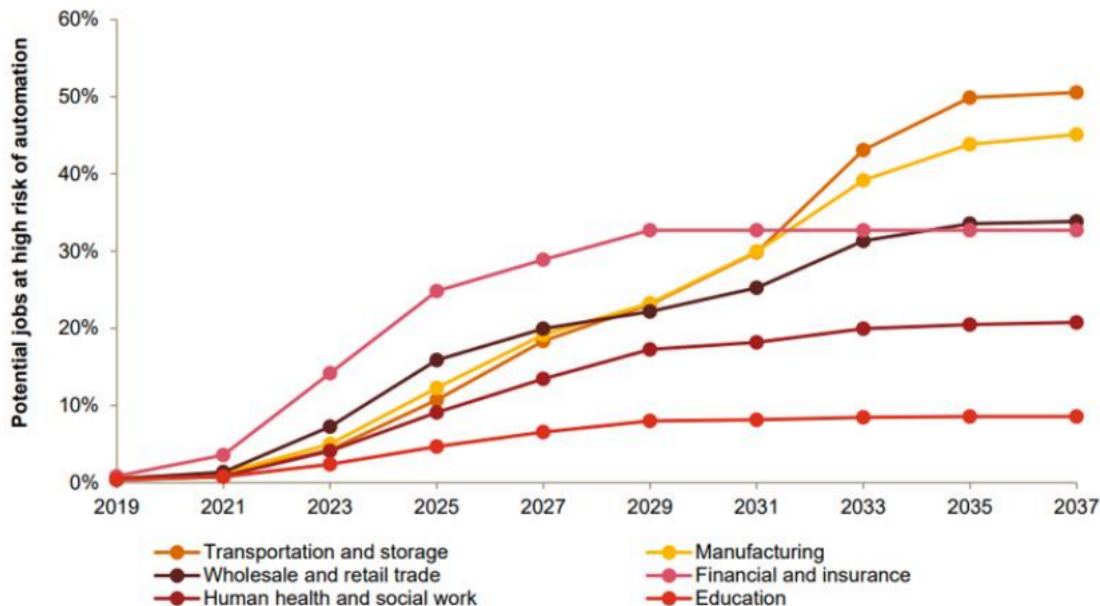
The automation process is expected to impact industries differently over time. For example, the financial and insurance sector has the highest share of existing jobs with a potentially increased risk of automation compared to other sectors in the algorithmic wave at the level of 8%, peaks at a level of slightly more than 30% at the beginning of the 2030s when it passes into the wave of autonomy.

¹⁰ Will Robots Really Steal Our Jobs?, PwC, 2018

https://www.pwc.com/hu/hu/kiadvanyok/assets/pdf/impact_of_automation_on_jobs.pdf

On the contrary, the transportation and storage, and manufacturing sectors have lower potential automation rates in the algorithm wave, with the rate rising to 50 % in the 2030s at the time of the wave of autonomy (at that time, the use of autonomous vehicles is likely to increase across the economy).

Graph 5 Potential jobs at high levels of automation



Source: PIAAC data, PwC analysis 2019

Research suggests that, at the macroeconomic level, job losses from automation are likely to be largely compensated by the increase in jobs resulting from new technologies such as artificial intelligence and robotics. These will be entirely new jobs that will be relatively highly skilled and highly paid but will likely be relatively few.



The biggest growth in jobs will be in sectors where these new technologies increase demand, either directly or indirectly, by increasing income and wealth.

They are expected to be concentrated in non-tradable service sectors such as health and education, which a wealthier and older society is likely to use more and which are, according to analyses, less automatable. In the case of education, increased demand is expected with an ageing population and rapid technological changes. At the same time, the services will mainly concern the elderly, who will want to retrain for a new career or study and develop personally at an older age. Even if it is possible to digitize education, it is assumed that the demand for a physical form of teaching, contact with a teacher, trainer, lecturer, mentor, etc., will continue. Since the population's average income grows, the demand for other jobs providing personal services will also increase (e.g., cleaning, cosmetics, manicure, pedicure, housework and repairs, personal training, design, designing, etc.).

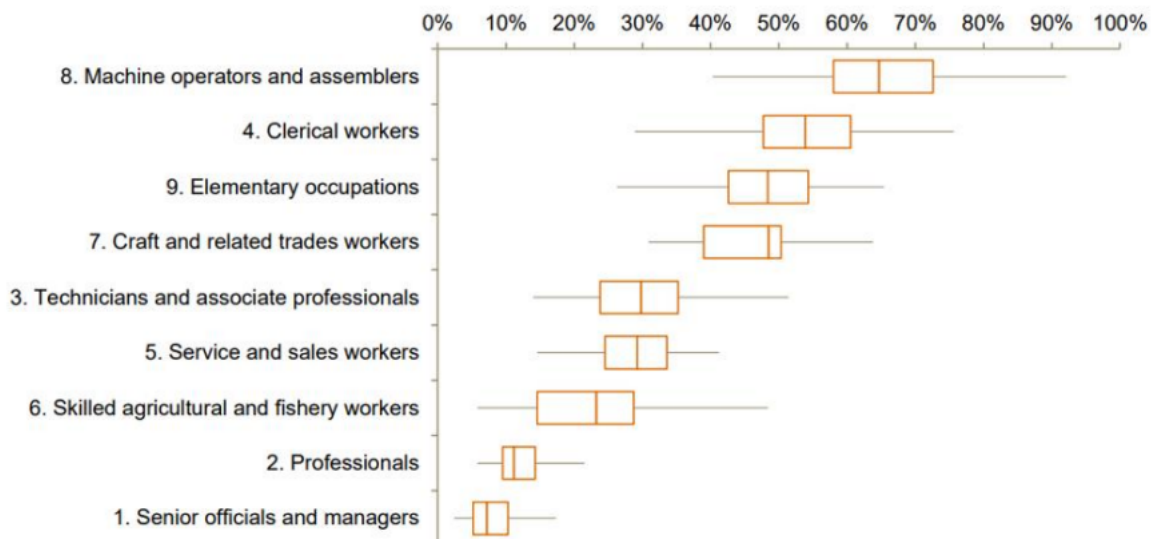
The states' economy can benefit from such increased tax revenues that new technologies will create.

Additional tax revenues could be used to finance higher public spending on healthcare and education, to support employment creation. Still, they could also be used for increased investments in infrastructure that would help the economy's supply side and create new jobs, e.g., in construction, transport, energy, and other sectors. The same applies to the developing circular and green economy when in connection with new materials, their recycling and the installation of new green technologies are expected to create a higher number of new jobs.

Key findings and predictions

- **The potential level of automation varies significantly depending on the occupation.** Machine operators and assembly workers could be at risk of more than 60% automation by 2030, while specialists and managers can face about 10% automation risk. These variations result from different types of tasks performed in other occupations and different qualification requirements.
- **Workers in different occupations will be influenced differently.** Technical and administrative workers could be most affected by the algorithmic and augmentation waves, where machines take over simple calculation tasks as well as routine information processing tasks. Machine operators and assembly workers may be most exposed to automation in the long term.
- **The level of automation of occupations usually varies from sector to sector.** One occupation can show different levels of automation in different sectors and countries depending on factors such as the average level of education of the workers, the progress of the division of labour, and specialisation.

Graph 6 The potential level of automation of individual occupations



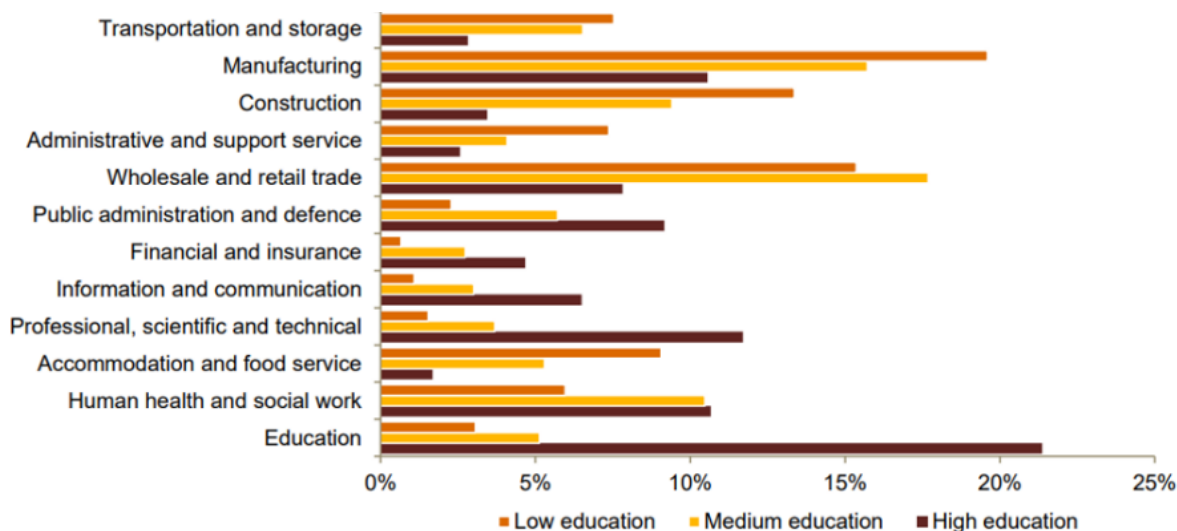
Source: PIAAC data, PwC analysis 2019

- **The potential risk of automation also varies significantly in terms of gender.** Men may face a higher risk of automation (34 %) than women (26 %) in the long term, as men are more likely to be employed in sectors with a higher share of manual work, such as manufacturing (13 %) and transport and storage (6 %), where a higher rate of future automation is expected. By

comparison, female employment in these sectors is relatively low, as women tend to be concentrated in sectors such as education and health, requiring more personal and social skills, which are usually less automated.

- **The risk of automation is prevalent among all age groups, but the differences are less pronounced.** Despite the risks some young workers face, they are potentially well-placed to seize new opportunities for digital technology deployment if they can obtain appropriate education or training. Similarly, older workers must be equipped with the skills required by future digital workplaces. The success of remaining in the labour market will depend on the quality and efficiency of further education.
- **On average, men with low education face the highest long-term risk of automation, above 50 %.** Highly educated workers, in terms of gender and age, are consistently less exposed to automation risks in the long term. Higher levels of education allow workers more flexibility in changing professions and sectors, making them more adaptable in the labour market and more resilient due to automation.
- **Automation waves will affect different types of workers differently over time.** In the short term, university-educated women carrying out administrative activities and highly qualified men in analytical professions can be significantly affected by automation. Lower-skilled men, e.g., drivers or performing manual activities, may face the highest automation risks, but only in the long term, e.g., after deploying autonomous machines and vehicles that can independently perform manual activities.

Graph 7 The impact of automation waves in relation to the sector and achieved education

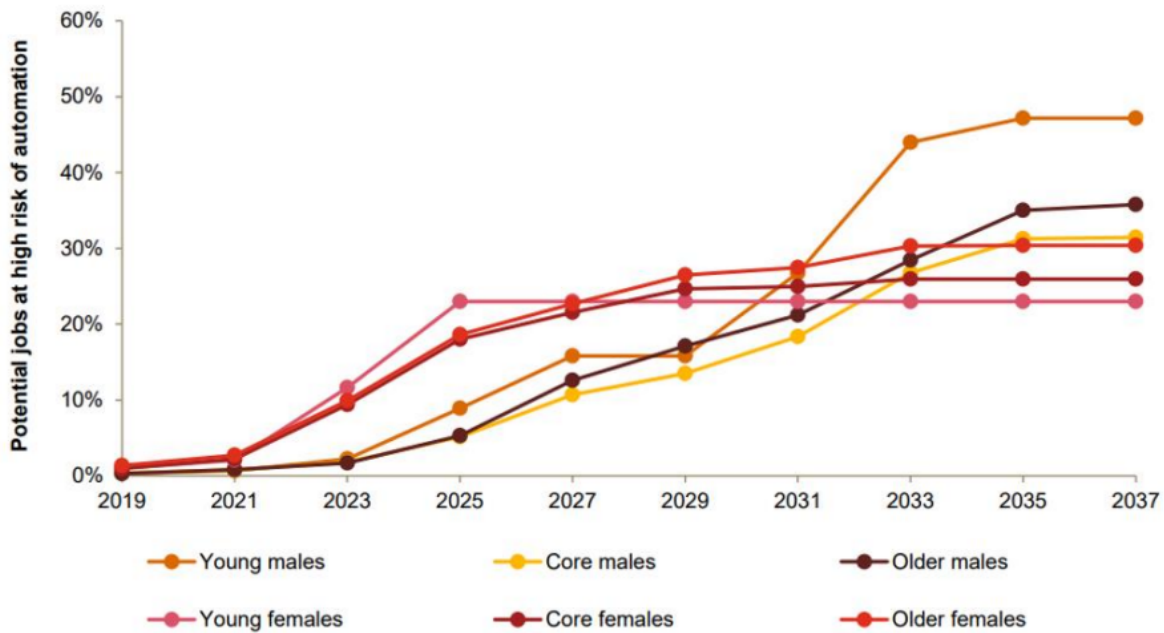


Source: PIAAC data, PwC analysis 2019

Educational structure of workers in sectors

The level of education of workers plays an important role in the level of risk of automation. Male workers with low and secondary education are least affected by the wave algorithm, as computational tasks usually make up a smaller proportion of their daily activities. However, at the end of the wave of augmentation, jobs with a high risk of automation are comparable between men and women with low or secondary education. In the final wave of autonomy, men with low education are expected to be at a much greater risk because manual and routine tasks will be more automated across the economy.

Graph 8 The impact on jobs with a high degree of automation in relation to age structure of men and women



Source: PIAAC data, PwC analysis 2019

Table 5 Distribution of workers at risk by automation by sex, age group, and educational level

Country	Sex		Age group			Education level		
	Female (%)	Male (%)	Young (%)	Core (%)	Older (%)	Low (%)	Medium (%)	High (%)
Slovakia	39	48	47	42	46	54	53	18
Slovenia	35	49	50	41	45	63	47	13
Lithuania	30	55	50	40	43	57	50	21
Czech Republic	38	42	40	38	45	51	47	11
Italy	32	44	42	39	39	45	43	16
USA	37	39	39	37	40	47	46	21
France	32	41	42	35	40	51	41	14
Germany	34	39	44	35	36	48	43	10
Austria	32	37	41	32	36	46	36	21
Spain	28	39	33	34	32	44	39	14
Poland	24	39	35	30	38	49	42	14
Turkey	19	36	41	30	35	38	35	7
Ireland	27	35	30	31	33	38	39	11
Netherlands	28	33	34	28	34	47	36	10
UK	26	34	32	28	36	47	35	12

Source: PwC, 2018¹¹

¹¹ Will Robots Really Steal Our Jobs?, PwC, 2018
https://www.pwc.com/hu/hu/kiadvanyok/assets/pdf/impact_of_automation_on_jobs.pdf

Expected impacts in the labour market

It is clear that new technologies can have an extremely positive impact on how we deal with the main "global" challenges: urbanisation, development, and demographic imbalance, climate change, poverty, gender differences, etc.

Digital transformation and technological development are accompanied by challenges that need to be mastered and opportunities that need to be seized, i.e., develop new skills in a balanced and strategic way. Most jobs will be characterised by a bipolar focus of demands on skills. **On the one hand, the demand for professional and technical-scientific knowledge will grow expertise. On the other hand, it will require applying soft skills, abilities, and competencies (flexibility, sharing, ability to cope with change, etc.).**

As stated by the OECD in the document "**The Future of Education and Skills - Education 2030,**" in the field of education and training, there is a growing demand/need to prepare students to master fast economic development, changes in the environment, and social affairs.



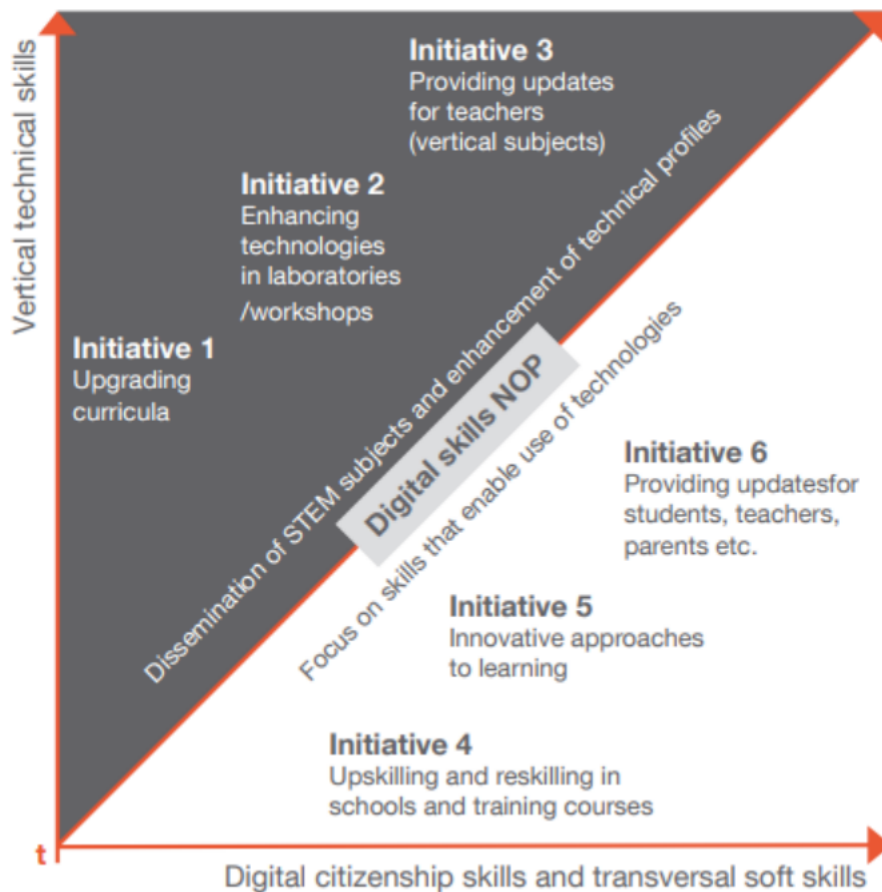
Although the findings are not validated by structured statistics, data from the WEF report point to the prospect that 65 % of today's children in primary education after obtaining a diploma or degree in the future will take up jobs that do not even exist today.

Slovakia suffers from a lack of systemic management of the digital skills development strategy. The national strategy should take the form of a national project focused on digital technologies and skills following **the Digital Europe Programme.**

Faced with the challenge of digital innovation in different directions (research, technological development, competitiveness, training, and retraining), the European Commission has recently decided to adopt a single digital education action plan with three priorities:

- Better use of digital technologies for education and learning;
- Development of digital skills and abilities due to the importance of digital transformation;
- Strengthening education through improved data analysis and predictive analysis;

Figure 1 Digital Education Action Plan



Source: PwC, 2020¹²

The European Commission monitors the digital progress of Member States using the Digital Economy and Society Index (DESI¹³) in the reports it has been publishing since 2014. Each year, the reports include country profiles which support Member States in identifying areas requiring priority action and thematic chapters offering a European-level analysis across key digital areas, essential for underpinning policy decisions. In 2021 the Commission modified the DESI to reflect two major policy initiatives that will have an impact on the digital transformation in the EU in the coming years:

- A mechanism to support recovery and resilience;
- Compass for the digital decade;

In 2021 (currently as of November 12, 2021), **Slovakia ranked 22nd among 27 EU Member States in the index (DESI)**. It remains in the same position as in 2020.

Slovakia is just below the EU average in terms of indicators in the area of human capital. 54 % of Slovaks

¹² www.pwc.com/it, 2020: Digital skills Rethinking education and training in the digital age: Digital skills and new models for learning, <https://www.pwc.com/gx/en/government-public-sector-research/pdf/pwc-digital-skills-eng.pdf>

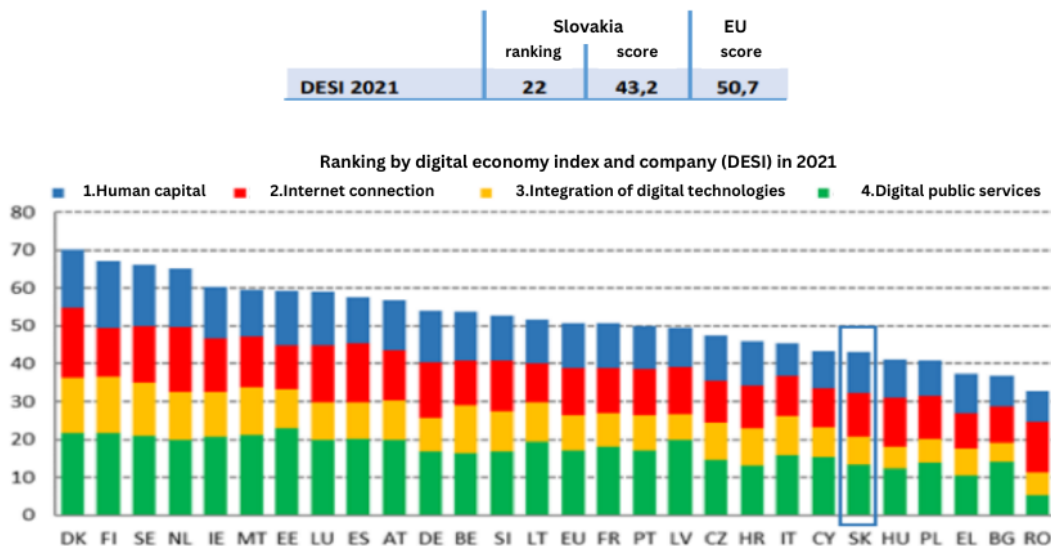
¹³ <https://digital-strategy.ec.europa.eu/en/policies/desi>

have at least basic digital skills, and 27% have above-average digital skills compared to the EU average of 56% and 31%. The number of ICT training companies in 2020 was 16 %, 4 percentage points lower than the EU average (20 %). The share of ICT specialists in total employment almost reached the EU average. Total usage of fixed broadband connection in Slovakia steadily increased from 72% in 2019 to 78% in 2020. Slovakia has significantly improved the introduction of super-fast internet and progressed in-network coverage with very high capacity, while the completed 5G auction improved the 5G readiness score. 52% of MSP have at least a basic level of digital intensity, which is below the EU average of 60%. 15% of businesses used at least two artificial intelligence (AI) technologies in 2020, compared to 25% in the EU. The number of companies using electronic invoices (eInvoicing) is 16%, which is significantly below the EU average of 32%. Most indicators for the field of digital public services are lower than the EU average, with the exception of 68 % of e-Government users in 2020 compared to 64% in the EU. Overall, Slovakia’s progress in the monitored areas is limited. Public funds spent to stimulate digital transformation have not always achieved the desired effect.



Digitalisation of education is not reaching its potential because schools, teachers, and students lack skills and tools. Fast broadband coverage and very high-capacity network must be improved, as this is an obstacle to the wider use of digital technologies and services.

Graph 9 Country ranking according to the Digital Economy Index (DESI) 2021



Source: Desi – National Report Slovakia 2021¹⁴

In the area of human capital, Slovakia ranks 19th out of the 27 EU countries and is thus below the EU average.

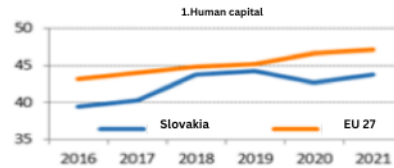
The education sector is experiencing the biggest mismatch between digital skills and ICT specialisation

¹⁴ <https://digital-strategy.ec.europa.eu/en/policies/countries-digitisation-performance>

needs, with around 10,000 ICT professionals needed. Raising the qualifications of teachers and other workers within the lower levels of the education system has become a priority. According to the State School Inspectorate, 45 % of schools do not have a qualified IT teacher.

Table 6 The area of Human Capital according to the Digital Economy Index (DESI) - National report Slovakia 2021

1.Human capital	Slovakia ranking	Slovakia score	EU score
DESI 2021	19	43,8	47,1



	Slovakia			EU
	DESI 2019	DESI 2020	DESI 2021	DESI 2021
1a1. At least basic digital skills % of the population	59 % 2017	54 % 2019	54 % 2019	56 % 2019
1a2. More than basic digital skills % of the population	33 % 2017	27 % 2019	27 % 2019	31 % 2019
1a3. At least basic software skills % of the population	63 % 2017	56 % 2019	56 % 2019	58 % 2019
1b1. ICT experts % of employed persons aged 15-74 years	3,2 % 2018	3,7 % 2019	4,2 % 2020	4,3 % 2020
1b2. ICT professionals (women) % of ICT experts	13 % 2018	14 % 2019	16 % 2020	19 % 2020
1b3. Enterprises providing training in the field ICT % of businesses	18 % 2018	18 % 2019	16 % 2020	20 % 2020
1b4. Graduates of the ICT department % of graduates	3,3 % 2017	3,9 % 2018	3,9 % 2019	3,9 % 2019

Source: Desi – National Report Slovakia 2021

Slovakia ranked 21st in the EU in integrating digital technologies by businesses. Only 52 % of MSPs achieve at least a basic level of digital intensity (EU average: 60 %). It lags behind the EU average for using AI in businesses (15 % versus 25 %) and cloud services (18 % versus 26 %). The share of big data analysis companies fell from 9 % to 6%. The e-commerce score has improved: 17% of MSP sell online, at the EU average level. However, the share of MSP turnover from e-commerce stagnates at 11% (avg EU: 12%). In 2020, 16% of businesses used electronic invoices, compared to 32% in the EU. 76% of enterprises in 2021 used information and communication technologies for more environmentally friendly measures at a medium-high to high level, which is 10 p.p. more than the average EU 66%.

Table 7 The area of Digital Technology Integration according to the Digital Economy Index (DESI) - National report Slovakia 2021

3.Integration of digital technologies	Slovakia		EU
	ranking	score	score
DESI 2021	21	29,1	37,6



	Slovakia		EU	
	DESI 2019	DESI 2020	DESI 2021	DESI 2021
3a1. SMEs at least with a basic level of digital intensity % of SMEs	not listed	not listed	52 % 2020	60 % 2020
3b1. Electronic information sharing % of businesses	31 % 2017	31 % 2019	31 % 2019	36 % 2019
3b2. Social media % of businesses	17 % 2017	18 % 2019	18 % 2019	23 % 2019
3b3. Big data % of businesses	9 % 2018	9 % 2018	6 % 2020	14 % 2020
3b4. Cloud % of businesses	14 % 2018	14 % 2018	18 % 2020	26 % 2020
3b5. Artificial Intelligence % of businesses	not listed	not listed	15 % 2020	25 % 2020
3b6. ICT for environmental sustainability % of medium /high intensity green measures through ICT	not listed	not listed	76 % 2021	66 % 2021
3b7. Electronic invoices % of businesses	15 % 2018	15 % 2018	16 % 2020	32 % 2020
3c1. SMEs using online sales % of SMEs	13 % 2018	11 % 2019	17 % 2020	17 % 2020
3c2. Turnover of e-commerce % of SME turnover	11 % 2018	11 % 2019	11 % 2020	12 % 2020
3c3. Cross - border sales via the internet % of SMEs	8 % 2017	7 % 2019	7 % 2019	8 % 2019

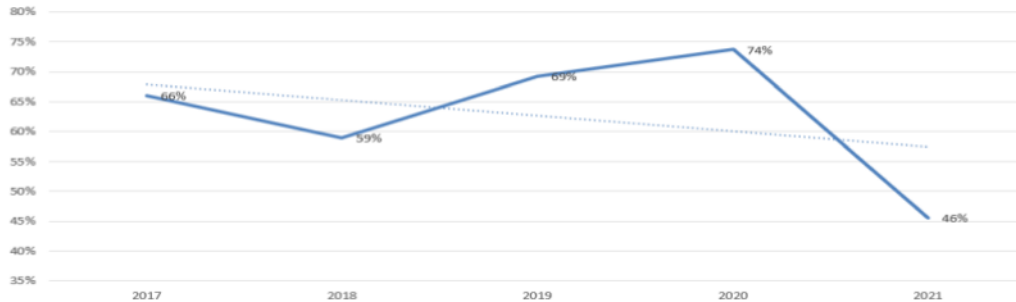
Source: Desi – National Report Slovakia 2021

According to a survey by Industry4UM and TRIXIMA Bratislava, 74% of companies consider the concept of Industry 4.0 essential for the future, but its adoption slowed down in 2020. It was caused partly by a challenging economic environment that inhibited investment. There is also a need for more expertise training and development of employees, and it is also necessary to strengthen the role of leadership in the transformation process¹⁵.

¹⁵ <https://industry4um.sk/vyhodnotenie-prieskumu-industry-4-0-v-sr-2020/>

Graph 10 Survey by TREXIMA Bratislava and Industry4UM, November 2021

YOUR OPINION FOR THE IMPORTANCE OF INDUSTRY 4.0 APPLICATION FOR NEEDS OF YOUR COMPANY: ANSWER - VERY IMPORTANT FOR THE FUTURE



Source: Trexima Bratislava, November 2021

Human resources appear to be the main obstacle to the significant pace of technological change enabling the competitiveness of Slovakia to grow. Barriers can be seen in two segments: adverse demographic developments and structural changes in the labour market. They will require a change in the training of human resources for the labour market, targeted further adult education, thoughtful age management in enterprises, and, last but not least, a comprehensive change in the business model, including an absolute change in human resources management in the new technological era.

CHAPTER 2

The demographic development and the development prognoses in the labour market until the year 2030+

2. THE DEMOGRAPHIC DEVELOPMENT AND THE DEVELOPMENT PROGNOSSES IN THE LABOUR MARKET UNTIL THE YEAR 2023+

Human capital will largely determine the economic stability of Slovakia. Its potential for the maintenance of socio-economic development until the year 2030+ will be determined by unfavourable demographic developments and the very quality of human resources in terms of the future needs of the labour market. The labour supply will decrease, significantly affecting employment and implementation of technological changes in companies, as well as social and working conditions. However, knowing the parameters of future development creates space for making fundamental decisions to support the increased birth rate, family policy, scope, and quality of lifelong learning.

Determinants of future development

The future demographic development is determined by several factors. The most important are demographic developments in previous decades and social, economic, and cultural influences on the demographic behaviour of the population.

Past demographic developments

Slovakia had two very strong generations after 1945 (Graph 10). The first was the 1950-1955 generation—when an average of 100,000 children were born annually. The second strong generation was between 1975-1980 when nearly 100,000 children were also born annually. The high numbers of children born between 1975-1980 were the children of the first strong generation born between 1950-1955, and it was the population's response to the state's social measures. In the late 1970s, strong cohorts of young women born after the 1950s entered the childbearing age.

Social, economic, and cultural influences on demographic behaviour population

With unchanged social, economic, and cultural influences, the 1970s generation could produce another powerful generation born in 2005-2010. However, at the end of the 1980s, a decrease in the number of children born, even in terms of one woman of childbearing age, can be observed. The decline in the birth rate was caused by a change in cultural norms, a preference for smaller families, and also the growing education of women. The importance of social, economic, and cultural influences on demographic behaviour increased after 1990. On the one hand, social security in employment and housing has been dramatically reduced.

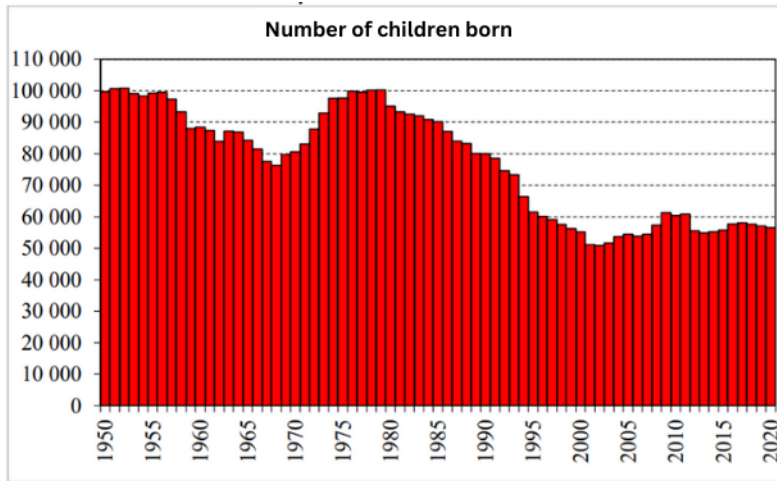
On the other hand, opportunities for education, career building, entrepreneurship, and travel have been expanded. Between 1990-1999, the annual number of childbirths dropped from 79,000 to 55,000. Only between 2008-2011 was a slight increase in the number of childbirths ('population miniboom'). These were the postponed births of women from the "Husák's children" generation who decided to have a child after their 30s.

The change of generations is the driving force behind the current decline in human resources in the labour market. The first strong generation (born between 1950-1955) has now retired or is retiring. Most

of these people had only primary and lower secondary education and worked in blue-collar professions. These job positions will be difficult to recruit, especially from the domestic population.

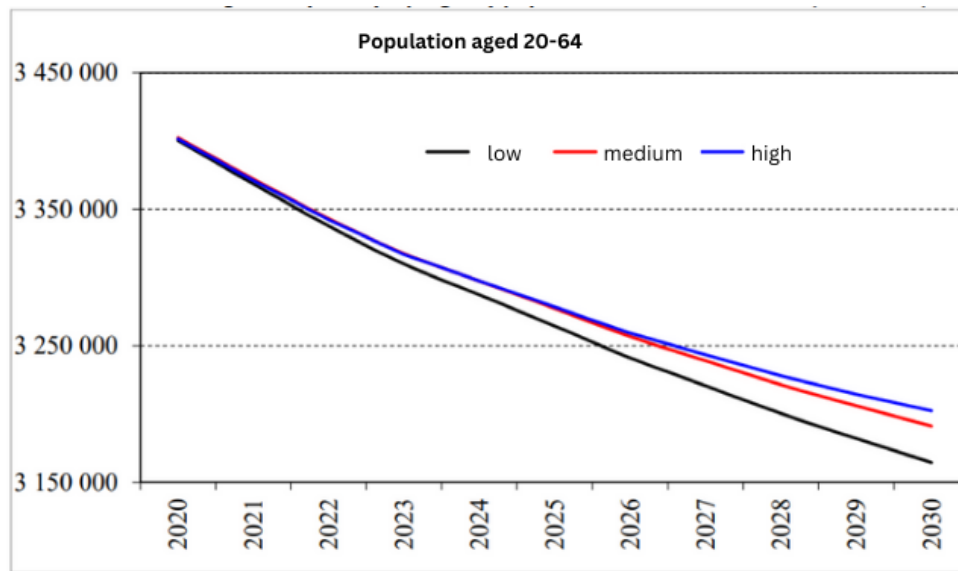
Very weak population years born after 1990 are entering the labour market. **The situation will still worsen significantly after 2040, when the second strong generation, born between 1975-1980, will start to retire.**

Graph 11 The number of live births in the years 1950-2020



Source: doc. Ing. Vladimír Baláž, PhD., DrSc. Based on data by Branislav Šproch (The Institute of Forecast SAS)

Graph 12 Demographic processes and prognoses of the population aged 20-64 (2020-2030)



Source: doc. Ing. Vladimír Baláž, PhD., DrSc. Based on data by Branislav Šproch (The Institute of Forecast SAS)

Alternative forecasts until 2030: the role of migration

Graph 11 shows the development of basic demographic processes and the resulting prognoses for demographic development in the SR. The determining factor is fertility and the number of children born. To a lesser extent, migration will influence the labour market's growth.

The future population development is modelled by three basic variants that differ in their assumptions of birth rates and migration. The population in the labour market is modelled as an age group of 20-64 years (Graph 11):

- **The low variant** predicts that the birth rate will increase from 1,557 children to one woman of childbearing age in 2020 to 1,610 in 2030. At the same time, the net migration balance will decrease from 3,436 inhabitants to 2,853 inhabitants. *In this variant, between 2020 and 2030, the number of residents aged 20- 64 years will decrease from 3.40 to 3.16 million.*
- **The medium variant** predicts that the birth rate will rise to 1,719 in 2030. At the same time, the net migration balance will increase from 3,374 inhabitants to 5,476 inhabitants. *In this variant, the population aged 20-64 will decrease from 3.40 to 3.19 million between 2020 and 2030.*
- **The high variant** predicts that the birth rate will increase to 1,826 in 2030. At the same time, the net migration will increase from 4,088 inhabitants to 8,318 inhabitants. *In this variant, the population aged 20-64 will decrease from 3.40 to 3.20 million between 2020 and 2030.*

As indicated by the development in Graph 11, even the high variant with a considered birth rate of 1,826 children per one woman of childbearing age and a net migration balance of 8,318 inhabitants, the population aged 20-64 will decrease by 199,000 in 2030 compared to 2020. The birth rate of 1,826 children per woman is now reached by only the most advanced European countries, which have profiled social services for mothers and high numbers of young immigrants from third countries. The more

realistic medium variant projects a decrease in the population aged 20-64 by 211,000 and a low variant by up to 236,000.



The ageing of the population will only manifest in the labour market in full force after 2040.

The high variant, which expects a net migration balance of 8,318 inhabitants in 2030, is in line with similar projections by the European Commission, which considers immigration 33 % higher than that envisaged by the medium variant as a high variant. How would the population aged 20-64 develop if we were able to accept much higher numbers of immigrants?

Variants of population development with basic, high and very high immigration are presented in Graph 13. The modelled development is based on the basic medium variant, which assumes an increase in the birth rate to 1,719 children per woman of reproductive age and an increase in the net migration balance to 5,476 inhabitants in 2030:

- **The variant with high immigration** assumes that in the period 2020-2030, *every year, an additional 10,000 immigrants will move* to Slovakia. This means that in a given period of 10 years, the number of inhabitants aged 20-64 will increase by a total of 100,000 thanks to higher immigration alone, as assumed by the middle variant. Even the variant with high immigration does not mean that Slovakia will manage to maintain the current population aged 20-64, 3.40 million. The size of this cohort will decrease by 111,000 inhabitants by the year 2030.
- **The variant with very high immigration** assumes that in the period 2020-2030, *every year an additional 15,000 immigrants will move* to Slovakia. This means that in a given period of 10 years, the number of residents aged 20-64 will increase by a total of 150,000 thanks to higher immigration than is assumed by the middle variant. In the variant with very high immigration, the number of inhabitants aged 20-64 will be reduced by only 61,000 inhabitants by the year 2030.

In fact, even a variant with very high immigration would not ensure the maintenance of the current status of the population aged 20-64. All demographic projections are based on permanent residence data of inhabitants of the SR. Therefore, they do not consider **approximately 330,000 Slovak citizens living abroad. According to the data from the Central Register of Insured Persons, over half are under 30 years old. Many of them will never return to Slovakia, and their children will grow up abroad.** Thus, if we wanted to maintain the current state population aged 20-64, we would have to increase the annual influx of immigrants to approx. 18-20,000 compared to the number assumed by the middle variant.

These projections indicate that high immigration will not completely solve the problem of labour shortages in Slovakia but can reduce it significantly.

However, we are talking about the necessary quantity of human resources in the labour market, even considering the gradual introduction of innovative changes, not about the proper quality. **Regarding the structure of education, the balance is not favourable when comparing the number of foreigners employed in Slovakia with the number of Slovak citizens emigrating for work in the short term.**

Table 8 Import and export of labour in the SR by education in 2014 – 2019

year	2016	2017	2018	2019	2020	2021 q1
	Import of labour					
primary school	5 086	7 669	8 562	7 263	6 242	6 214
high school without diploma	10 031	14 862	22 643	27 769	24 643	29 397
high school with diploma	9 330	12 831	18 802	22 180	19 051	19 131
university	7 423	9 130	14 010	16 745	15 339	15 228
	Export of labour					
primary school	5 700	3 700	5 800	5 100	2 900	2 800
high school without diploma	66 800	51 300	45 400	39 900	40 000	38 200
high school with diploma	64 500	77 800	67 700	65 100	55 600	54 700
university	23 300	17 000	18 800	19 100	19 700	14 500
	Balance of import and export of labour					
primary school	-614	3 969	2 762	2 163	3 342	3 414
high school without diploma	-56 769	-36 438	-22 757	-12 131	-15 357	-8 803
high school with diploma	-55 170	-64 969	-48 898	-42 920	-34 549	-35 569
university	-15 877	-7 870	-4 790	-2 355	- 4 361	728

Resources: Headquarter of the PSVR, Labour Force Selection Survey and processing of doc. Ing. Vladimír Baláž, PhD., DrSc. Notes: Numbers at the end of the year. Data for 2021: June for foreigners in the SR and the first quarter for Slovak citizens migrating for work in the short term. When importing labour, only foreigners with a known level of education were considered.

The data in the table above indicate several trends:

- Despite the ongoing economy and high demand for labour in the Slovak labour market in 2020, the number of Slovaks migrating short-term for work (120,000) was almost twice as high as the number of foreigners working in Slovakia (69,000).
- From the point of view of the structure of education, the number of working migrants with basic and lower education is increasing in Slovakia's secondary education. Immigrants with primary education are the only educational category where Slovakia has a positive labour trade balance.
- Slovakia has a persistently high deficit in trade with the labour force, which has an upper secondary level of education.
- In recent years, Slovakia has managed to increase the number of working immigrants with university degrees and education, thanks to which the balance of trade in this segment approaches balanced figures.

"The business with human capital" can also be quantified according to the performed jobs structure based on the SK ISCO-08 classification.

Table 9 Import and export of labour in the SR by occupation in 2016 - 2021

SK ISCO-08	2016	2017	2018	2019	2020	2021
Dovoz pracovných síl						
0 Príslušníci ozbrojených síl	0	0	0	0	0	1
1 Zákonodarcovia, riadiaci pracovníci	2 153	2 318	2 797	2 888	2 706	2 652
2 Špecialisti	3 847	4 465	6 139	6 805	6 995	6 997
3 Technici a odborní pracovníci	2 580	3 056	3 804	3 583	3 963	4 216
4 Administratívni pracovníci	1 172	1 630	3 014	3 752	3 819	3 908
5 Pracovníci v službách a obchode	2 488	3 148	4 968	5 663	5 498	5 231
6 Kvalifikovaní pracovníci v poľnohosp. a lesníctve	192	250	298	392	372	417
7 Kvalifikovaní pracovníci a remeselníci	3 236	4 442	7 972	10 812	9 139	8 816
8 Operátori a montéri strojov	9 853	17 433	25 971	31 325	25 625	25 284
9 Pomocní a nekvalifikovaní pracovníci	6 503	9 879	11 891	11 718	9 696	9 608
Vývoz pracovných síl						
0 Príslušníci ozbrojených síl	0	1 000	400	0	400	500
1 Zákonodarcovia, riadiaci pracovníci	2 300	2 100	3 000	2 100	2 800	1 700
2 Špecialisti	6 800	4 400	5 900	5 700	6 700	7 700
3 Technici a odborní pracovníci	11 200	12 800	11 700	11 900	10 000	7 300
4 Administratívni pracovníci	7 100	5 200	4 000	3 700	3 900	3 100
5 Pracovníci v službách a obchode	47 000	44 200	36 400	31 400	24 700	20 400
6 Kvalifikovaní pracovníci v poľnohosp. a lesníctve	1 700	3 100	2 100	1 900	800	400
7 Kvalifikovaní pracovníci a remeselníci	46 000	40 200	43 100	42 000	40 400	39 800
8 Operátori a montéri strojov	16 200	18 400	17 400	16 800	16 700	17 400
9 Pomocní a nekvalifikovaní pracovníci	15 200	18 200	13 700	10 800	11 800	11 900
Bilancia vývozu a dovozu pracovných síl						
0 Príslušníci ozbrojených síl	0	-1 000	-400	0	-400	-500
1 Zákonodarcovia, riadiaci pracovníci	-147	218	-203	788	-94	952
2 Špecialisti	-2 953	65	239	1 105	295	-703
3 Technici a odborní pracovníci	-8 620	-9 744	-7 896	-8 317	-6 037	-3 084
4 Administratívni pracovníci	-5 928	-3 570	-986	52	-81	808
5 Pracovníci v službách a obchode	-44 512	-41 052	-31 432	-25 737	-19 202	-15 169
6 Kvalifikovaní pracovníci v poľnohosp. a lesníctve	-1 508	-2 850	-1 802	-1 508	-428	17
7 Kvalifikovaní pracovníci a remeselníci	-42 764	-35 758	-35 128	-31 188	-31 261	-30 984
8 Operátori a montéri strojov	-6 347	-967	8 571	14 525	8 925	7 884
9 Pomocní a nekvalifikovaní pracovníci	-8 697	-8 321	-1 809	918	-2 104	-2 292

Resources: Headquarter of the PSVR, Labour Force Selection Survey and processing of doc. Ing. Vladimír Baláž, PhD., DrSc. Notes: Numbers at the end of the year. Data for 2021: June for foreigners in the SR and the first quarter for Slovak citizens migrating for work in the short term. When importing labour, only foreigners with a known classification of employment were considered.

Foreigners employed in Slovakia worked mainly as skilled workers and craftsmen (13.6 %), operators and machinery and equipment installers (39.2 %), and auxiliary and unskilled workers (15.7 %).

Slovak citizens work abroad mainly as qualified workers in services and trade (24.9% in 2019), skilled workers and craftsmen (33.3%), technical and professional workers (9.4%), operators, and machinery and equipment installers (13.3%).

The comparison for the year 2020 indicates that the SR lost qualified workers and imported workers with the lowest or no qualifications instead of them.

An analysis of long-term trends in the employment of foreigners and the export of labour from the SR indicates a mix of negative and positive trends:

- In 2016-2020, the share of foreigners working in the least qualified sectors increased, especially in jobs according to SK ISCO 08 - Operators and installers of machinery and equipment. The increased influx of foreigners working in these jobs originates from the growing production in the automotive, mechanical, and electrical industries and the declining interest of the domestic population in employment in these sectors. In relative terms, the share of foreigners working in

jobs with the highest qualification in classes SK ISCO 08 - Legislators, managers; Specialists; Technicians, and professional workers is decreasing.

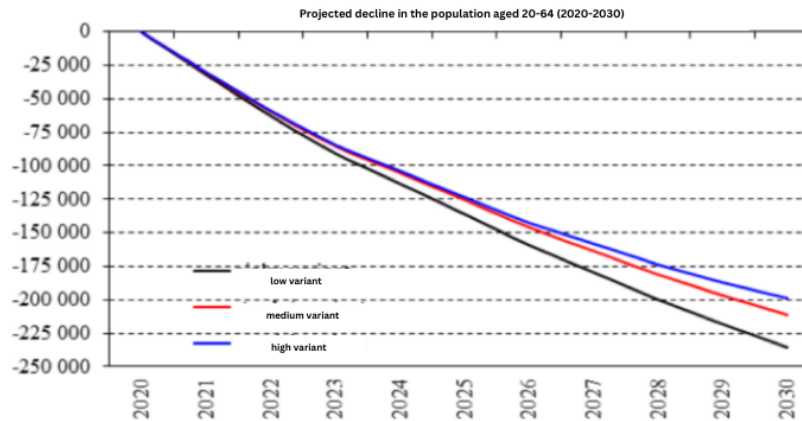
- However, Slovakia manages to increase the absolute number of immigrants working in jobs requiring the highest qualification: SK ISCO-08 Legislators, managers, and Specialists. In these two classes, Slovakia has achieved a positive balance in recent years, especially thanks to the increased influx of immigrants working in these jobs. The number of Slovaks working abroad in these jobs is slightly decreasing.



Despite some positive changes in recent years, both in terms of education and employment structure, the “human capital trade” balance remains highly negative for the SR.

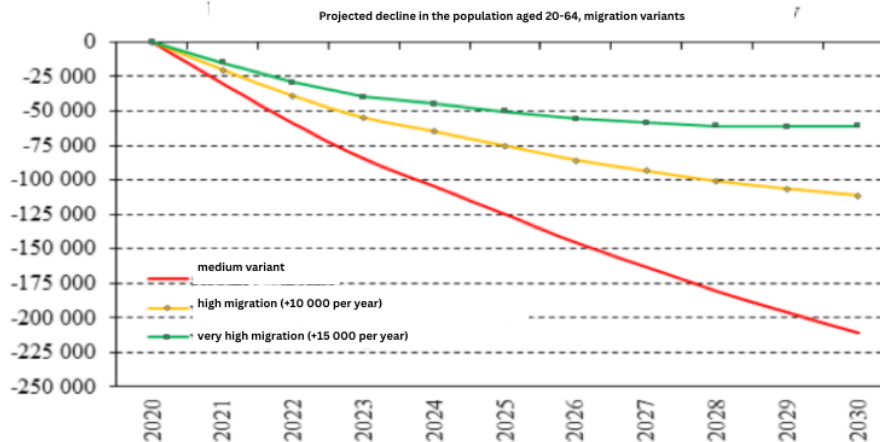
In fact, the negative balance of Slovakia in the ‘human capital trade’ is even higher than indicated above. Data from the PSVR Headquarters includes all foreigners working in the SR, while the VZPS data on Slovaks abroad only cover short-term labour migration. Considering data from population registers abroad, the Central Register of Insured Persons in the SR, and employment rates, the total numbers of Slovak citizens working abroad (short and long-term) are at least half as high as indicated by the VZPS. Specific VZPS data about 120,000 Slovaks who short-term migrant for work in 2020 is possible to adjust to at least 210,000. Similarly, the ‘human capital trade’ balance is possible to adjust.

Graph 13 Projected decline in the population aged 20-64 (2020-2030)



Source: doc. Ing. Vladimír Baláž, PhD., DrSc. Based on data by Branislav Šproch (The Institute of Forecast SAS)

Graph 14 Projected decline in the population aged 20-64 (2020-2030), taking into account migration variants



Source: doc. Ing. Vladimír Baláž, PhD., DrSc. Based on data by Branislav Šproch (The Institute of Forecast SAS)

Demographic development in the SR until 2030 by age groups

The ageing of the population is a key factor in the development of the Slovak labour market. Because, however, it will manifest itself in full force only after 2040, until 2030, there will be no fundamental change in the structure of the population aged 15-74 by age groups (Table 9, Graph 14). There will be only a slight increase or decrease in the number of people in certain age groups:

- In 2030, children born during the population miniboom in the years 2008-2011 can enter the labour market. The number of people aged 15-19 will rise from 262,000 in 2020 to 288,000 in 2030. However, it is safe to assume that most of these people will prefer university studies to work and will not enter the labour market until around 2035.
- The relatively most significant shifts are expected in the 25-59 age group. On the one hand, the number of people in the age groups 25-29, 30-34, 35-39, and 40-44 will decrease significantly (by

84,000, 112,000, 83,000, and 53,000). On the other hand, the number of people in the 45-49, 50-54, and 55-59 age groups will increase significantly (by 16,000, 98,000, and 41,000 people). The number of people in the 60-64 age group will drop by 32,000. These are members of the weaker population cohort born between 1965-70.

- By 2030, the number and share of people aged 65-69 will decrease from 336,000 to 319,000. These are members of a relatively weaker population cohort born between 1960-65. At the same time, the number of people aged 70-74 will increase, i.e., members of the strong cohort born between 1955-60, from 249,000 to 300,000.



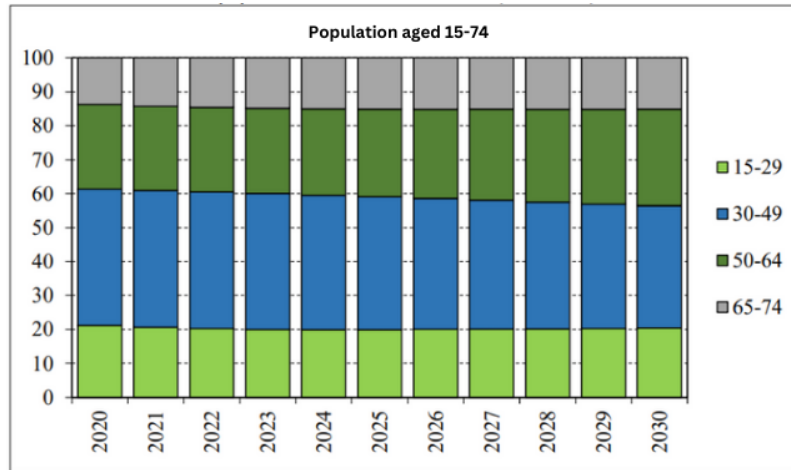
It will be important to change the age structure for the labour market in 2030 than the overall decline in the labour force. For employers, this will mean adapting the processes to this change and directing them to the specific needs of older workers. On the part of the state's active policies, this presupposes an effective age-management policy.

Table 10 The number of Slovak inhabitants aged 15-74 in the period 2020-2030

vek	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
15-19	262 217	264 527	268 108	273 432	279 250	282 877	290 393	292 764	291 944	288 739	288 016
20-24	286 767	278 732	271 150	266 072	264 213	263 737	266 120	269 745	275 091	280 922	284 554
25-29	351 223	334 309	319 691	304 570	295 083	289 411	281 569	274 123	269 127	267 307	266 857
30-34	403 411	396 795	389 123	381 060	369 067	352 277	335 595	321 162	306 179	296 761	291 129
35-39	434 853	431 065	425 212	419 093	410 880	402 871	396 457	388 950	381 006	369 095	352 392
40-44	454 825	450 814	446 350	441 285	435 265	433 561	429 956	424 264	418 271	410 153	402 228
45-49	414 706	430 286	441 822	448 890	452 204	451 205	447 362	443 053	438 130	432 242	430 614
50-54	345 983	349 361	359 560	375 259	392 142	407 848	423 266	434 703	441 754	445 123	444 220
55-59	356 489	352 627	348 854	341 725	337 060	336 211	339 680	349 770	365 189	381 771	397 202
60-64	354 274	348 227	341 424	339 594	341 576	340 175	336 743	333 345	326 780	322 612	322 075
65-69	336 452	339 982	340 902	339 952	335 334	330 179	324 937	318 975	317 654	319 882	318 929
70-74	249 193	266 618	278 426	287 891	297 080	303 249	306 932	308 221	307 794	304 007	299 800
spolu	4250393	4243343	4230622	4218823	4209154	4193601	417 0100	4159075	4138919	4118614	4098016

Source: doc. Ing. Vladimír Baláž, PhD., DrSc. Based on data by Branislav Špröch (The Institute of Forecast SAS)

Graph 15 The structure of SR population aged 20-74 (2020-2030)



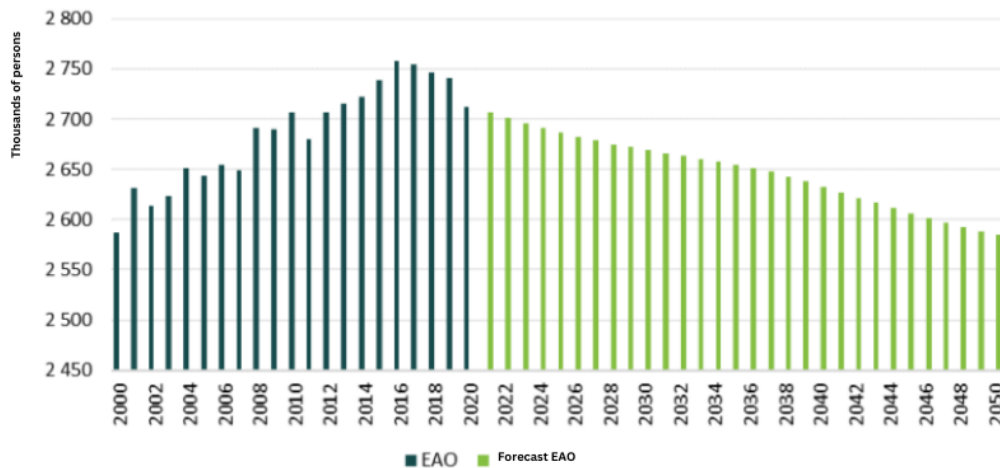
Source: doc. Ing. Vladimír Baláž, PhD., DrSc. Based on data by Branislav Šproch (The Institute of Forecast SAS)

The number of economically active inhabitants is a primary indicator expressing the labour force supply. The labour force supply depends primarily on the number of inhabitants in the productive age, which depends on the number of live births in the horizon 20-64 years ago¹⁶. That means they are currently in the productive age and make up the majority of the labour market supply of people born between 1956-2000. **In 2030, most of the economically active population will be people born between 1966-2010, when 347,000 fewer children were born than between 1956-2000.**

Therefore, we cannot avoid a fundamental decline in the economically active population. This decline actually already started in 2017 and will continue until the strategic year of 2030. In that year, there will be 50,000 fewer economically active people than in the present under the conditions of the SR. This decline will continue approximately until the year 2060, when it will stagnate.

¹⁶ The paradigm has changed in the new millennium, and only a negligible number of people enter the labour market in the horizon 15-18 years. On the one hand, people continue their studies to a greater extent at secondary school with a high school diploma, but also at university school, and only a smaller part of the cohort enters the labour market before the age of 19. Because of this, the dependency between the economically active population and the number of people aged 20-64 is higher than the established cohort in productive aged 15-64.

Graph 16 The development and prognosis of the economically active population (EAO) in the period 2000-2050 in the SR



Source: ŠÚ SR, prognosis and processing by TREXIMA Bratislava

Apart from demographic development, several other exogenous factors enter the economic activity, which cannot be predicted with certainty such as, e.g., migration.



In the conditions of the SR, the labour market supply will be limited and unfavourably influence the further development of the labour market and employment.

Since the country's economically active population is the primary labour source for the labour market, its continuous decline will create pressure on employers and reduce the investment lucrativeness of the SR from the point of view of human capital. Mainly due to the decrease in economic activity, it is very likely that under the conditions of the SR, it will not be possible to achieve significantly higher employment in the future than is the case nowadays.

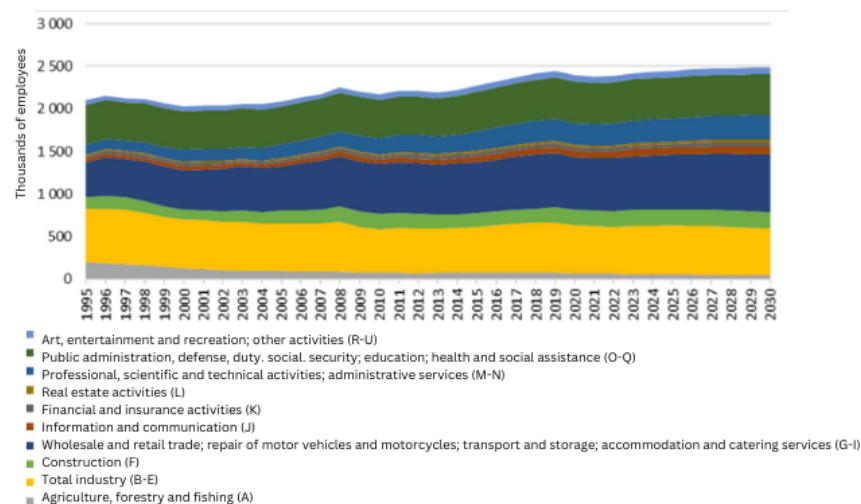
In efforts to correct the labour force supply, it is necessary to act significantly in advance. Today, we can no longer significantly impact demographics in 2030 and, thus, labour market supply. But this does not mean that we should not act and take measures to stop negative developments in the distant future. The key to positive development is **birth rate growth, which can be ensured by increased support for families and children in the framework of national social policy**. If we adopt changes in this area today, their effects in the labour market will start to materialize as early as 2040. Additional information on demographic development is provided in Annex 2

However, this is not only about the labour market supply but also about the burden on the country's social system and, above all, about limiting the further development of the labour market. There may be a situation when employers want to hire more employees but will not have sufficient labour supply. This will motivate them to employ foreigners but may also lead to moving part of the production to other countries. The decline in the economically active population will thus have adverse effects on the country's public finances and other economic indicators.

Industry makes up the majority of production and employs the most people, which is why we are an industrial country. However, it does not mean that our labour market is becoming increasingly dependent on industry. The industry has maintained constant employment for almost a quarter of a century, with fluctuations during economic cycles.

However, the industry is declining in terms of the share of total employment. Industrial production, mining, and energy employed approximately 30% of all workers in the SR until 1998. In 2008, only 26%, and today, 23.5% of people work in industry. In 2008, it was only 26 %, and today 23.5 % of people work in the industry. Even by 2030, fluctuations around a constant level of employment can be expected, but the share of employment will continue to decline to 22 %.

Graph 17 The development and prognosis of the employment structure according to the sectors of economic activity SK NACE Rev.2 in SR until 2030



Source: *Prognosis and processing by TRIXIMA Bratislava, ESA2010*

However, the long-term and highest decline in employment is recorded in agriculture. While in 1995, more than 200,000 people worked here, approximately every 10th working person in the SR, in 2008, it was only 3.6%. Nowadays, agriculture has a 2.9% share, and 70,000 people work in it. This sector's employment share has been declining for nearly 25 years¹⁷. Therefore, the decline of agriculture will likely persist until 2030, when it is expected to employ approximately only 45,000 workers, with a share of 1.8% of total employment.

This decrease occurs primarily as a result of the transfer of capital to sectors with higher added value and profitability. Agriculture is not competitive in the SR conditions. Above all, it is not competitive in price compared to cheap imported products. However, it is a key sector, and its decline threatens Slovakia's overall integrity and self-sufficiency. In the present, in the "good times," we do not feel that we are lacking any agricultural, but at the time of a significant war conflict, unexpected climate changes, or other changes affecting the current global market with agricultural products, a real problem - not a financial one, but a potentially lethal one, as agriculture creates products that are basic life needs. Because the SR allows domestic agriculture to decline and cannot support it in international competition, we destroy one

¹⁷ The only exception is 2013 in the entire period 1995-2020 when the share of agriculture in the total employment increased (by approximately 0.18 percentage points.)

of the most important industries for life. In a critical situation, people can live without the Internet, without machines, cars, without restaurants, hotels, fashion stores, sports, and cultural facilities, but not without food. Therefore, the state must think not only about the "market-wise" but also whether market principles and development do not threaten the life and safety country in the long term. **It is essential to keep this key industry competitive in the labour market, the recruitment and education of the labour force, but also the market of products and services.**

The rapid growth of services is typical for the Slovak labour market. Professional, scientific, and technical activities and administrative services have nearly doubled over the past two decades. Information technologies and communication increased by 65%, real estate activities by 50%, Trade, accommodation and food services, and transport and storage by 34%. **Trade is becoming the dominant economic category of the economy, and its further growth is expected by 2030 by approximately 10%, along with accommodation, catering services, transportation, and storage will employ more than a quarter of all workers in Slovakia. The fastest growth can be expected in IT, which will be in 2030, employing 30% more employees than nowadays.** Next will be professional, scientific, and technical activities and administrative services, with expected growth of 17%.

The paradigm is changing, and in the coming years, it will be mainly IT, which will also help other industries in digitisation, automation, and optimisation of processes. All these processes will occur in a natural way and through competitive market pressure. A significant problem, however, is that IT is much more globalised than other sectors. If the SR is not prepared to secure these changes, or there will be no qualified labour force, employers will use solutions from abroad. **It is necessary to significantly increase the quantity and quality of the IT labour force because, without it, Slovakia will not benefit from future changes, but other countries that have realised this urgent need and have taken the necessary measures will.**

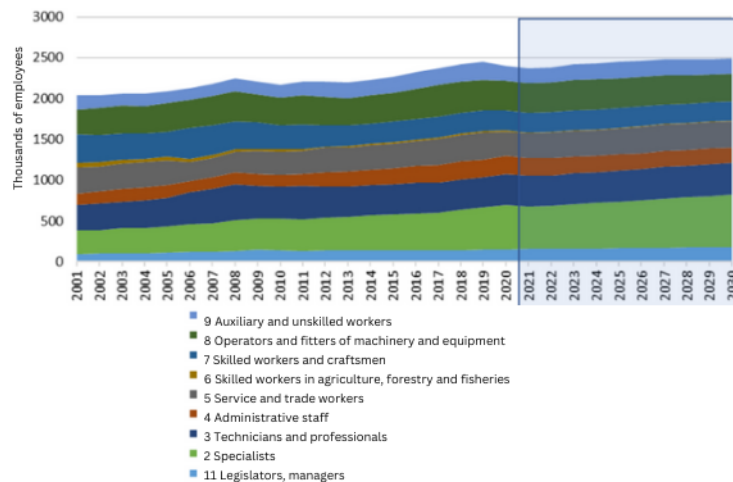
In general, however, overall employment in Slovakia will increase slower than in the last 10 years. Already in the pre-pandemic expansion period 2017-2019, the Slovak labour market had felt certain limits. Labour force shortages were recorded and although the demand in the labour market was enormous, employers were unable to find suitable workers. In the further growth of employment, Slovakia began to be hindered by the limited labour market supply. It was precisely in 2017 that a gradual decline in the economically active population¹⁸ or labour market supply began, and this decline will continue to increase until 2030. Overall employment should be higher than the historical peak of 2019, but only a few tens of thousands of employees (only around 4 % higher than in 2020). **Labour market supply constraints will exacerbate the labour force struggle and will also have an impact on strong wage growth.** There will be a restructuring of the labour force, which will begin to flow even more into sectors with higher added value and higher wages. Unless wage growth in these areas is set and supported closer to a competitive level, fields such as agriculture and accommodation services, healthcare, education, and social services will be put even more on the edge of the interest labour force.

Similarly, as in most developed countries, **the labour market in the SR is moving towards highly qualified jobs, primarily for specialists.** While this category comprised only approximately 14% of employment at the turn of the millennium, it is up to 22% today. As demand growth for specialists has been virtually uninterrupted and stable over the past 20 years, it can be said with certainty that it will continue until

¹⁸ See the previous section dedicated to the labour market supply and the economically active population.

2030. In 2030, more than a quarter of jobs will be for specialists. Significant market competition creates pressure on production efficiency and labour productivity growth. Not that there was no competition in the past, but in the past, there were not enough cost-effective tools to automate processes on such a significant scale. Today, these tools exist, they are affordable, and new ones continue to come. Organisations continuously implement them into their processes, thus creating pressure on their competition.

Graph 18 The development and forecast of the employment structure according to the main classes SK ISCO-08 in the SR until the year 2030



Source: Prognosis and processing by TREXIMA Bratislava, ESA2010, ISCP

Specialised labour forces are essential to make work more efficient for tens, hundreds, and thousands of primarily low-skilled employees to implement such changes in production processes. Streamlining production processes means that the company can produce more goods and services with the same labour input. If this streamlining of production is ongoing faster than the demand for goods and services grows, employment will decrease. As the automation of elementary activities is simpler and less costly than highly specialised ones, this potential decline in employment linked to production efficiency will primarily affect the low-skilled labour force in the first phase. Also, because of these reasons, by 2030, a significant increase in demand for low-skilled jobs is not expected.

In 2000, jobs requiring lower qualifications had a share of 60%; today, this share is 46%¹⁹. By 2030, this share will continue to decrease to approximately 43%. This structural change comes not only in terms of streamlining production but also due to digitalisation and the expansion of highly qualified sectors such as IT, scientific, professional, and technical activities, where future labour demand growth will be the strongest.

Demographic processes also affect the labour market demand.

¹⁹ In this case, we include the main employment classes 5-9 in low-skilled jobs. The classification of main class 5 can be debatable - workers in services and trade. Most of these main employment classes are represented by salesmen and waiters, who can be regarded as low-skilled workers. However, even if we did not include this main class of employees in the low-skilled labour force, nothing would change in the development tendencies of this category, and the significantly decrease even without the given main class.

Since outgoing cohorts are approximately 50% higher than incoming cohorts, **each growth retirement age by 1 year "solves" the insufficient labour force replacement in the labour market for approximately 1.5 years.** If Slovakia wants to avoid the problem of inadequate labour replacement in the labour market and growing economic burden, the retirement age must increase by 2 years every three years. The word "solves" is in quotation marks because raising the retirement age is not and cannot be a sustainable solution to grow to infinity. Not to mention the human body's physiological limits and social tension growth in society cannot grow to infinity either.



Balancing between the increase in the retirement age and the workers shortage and the growing socioeconomic burden will be one of the most pressing social issues and problems that Slovakia will face in the next 20 years.

Indeed, 20 years is the horizon in which it is possible to influence this discrepancy through the birth rate growth. If measures to address this problem are not taken today, the negative situation and practically unmanageable pressure on public finances and the social system will continue for a very long time. This pressure can ultimately result in the collapse of the social system in the SR.

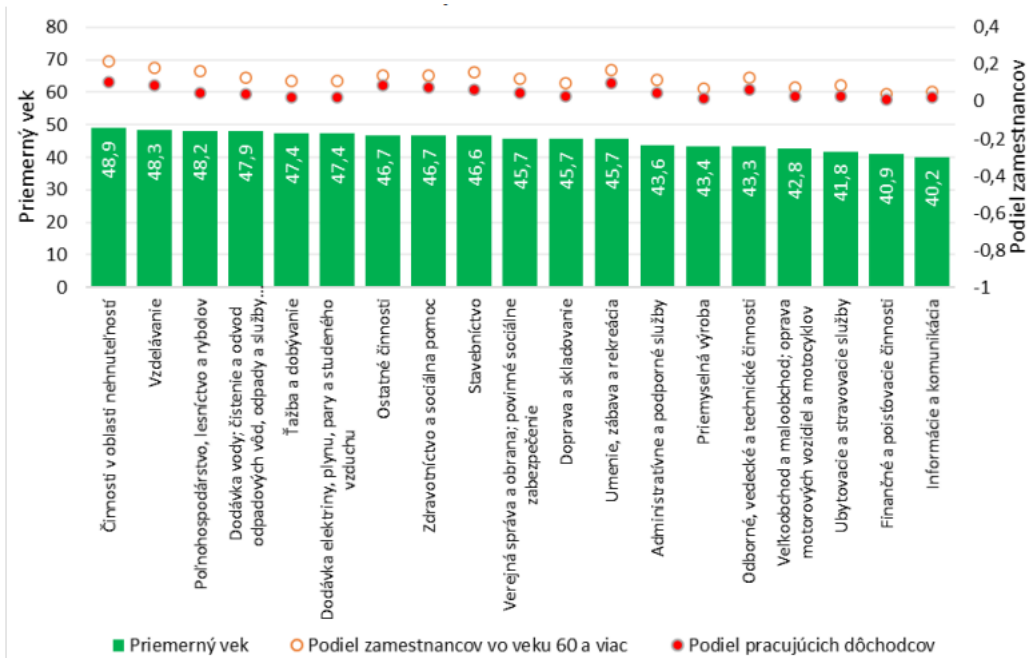
From the point of view of the labour market, it is essential to monitor not only the development trends of employment but also jobs released as a result of employees leaving the labour market, primarily for retirement. Replacing labour forces, or replacement demand, is a stable part of labour market demand even during economic shocks. It constitutes and will constitute 60 to 90% of all job opportunities created in SR conditions depending on the phase of the economic cycle²⁰. The fundamental problem is the division of labour between those that will meet demand driven by labour replacement and economic expansion/economic development. This problem is relatively new, but it will still become more critical in the future due to insufficient supply in the labour market. Economic expansion and the growing number of jobs is in other areas (such as IT, scientific professional, and technical activities) and employment opportunities driven by labour force replacement.

The highest number of people aged 60 and over are employed in education, industry, and healthcare. In these sectors, labour force replacement will also play a key role in the future. **Further significant employment growth is not expected in the industry. However, from labour sources under the conditions of the SR, the industry will not be able to satisfy even its replacement demand.** A similar situation applies to education, where employees' second highest average age is 48.3 years. Demographic development will also affect the quantitatively decreasing demand for education. That means that schools will have a lower number of pupils and students. **Sooner or later, it will have to happen to the restructuring of educational institutions and the teaching staff, which were quantitatively set to**

²⁰ The replacement demand created by the departure of employees from the labour market is only slightly dependent on whether the economy is in recession or expansion. Unlike the so-called expansionary demand accompanied by a change in the level of employment, labour force replacement is a stable component of demand in the labour market. During the recession, when the creation of new jobs is limited, replacement demand can make up to 90% of all new job opportunities on the market. On the other hand, in times of economic expansion, its share decreases to around 60% of the job opportunities created. However, even in times of high economic expansion, the labour market demand dominates.

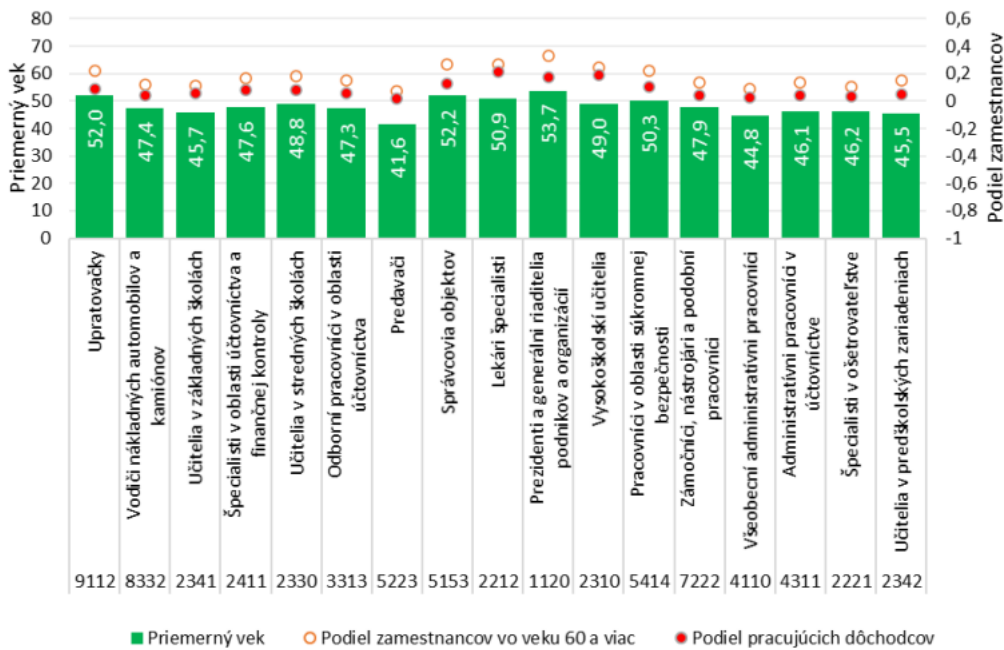
almost double the number of pupils and students from the previous period. In the next 20 years, however, we will not even come close to these numbers, and adapting the education system to this new situation will be necessary. This will also be reflected in the decrease in the number of teaching staff, and therefore education does not expect further employment growth. However, this does not mean that teachers will not be needed. On the contrary, it will be primarily required as a result of labour replacement since almost 20% of employees in education are aged 60 and over, and nearly 10% of employees are already at retirement age. Analogously, it also applies to agriculture. Although it is an industry with one of the most distinctive expected declines in employment until 2030, despite this, there will be a labour force replacement to create enough job opportunities. It is the third oldest industry in Slovakia, and about one in six employees in the industry are aged 60 or over. If Slovakia only looks at employment trends and adapts its education structure, there will be significant problems in these sectors with the highest concentration of older people. This development is in the highest contrast to the development in the IT field, where the highest expansion demand and employment growth are expected. However, since it is the youngest industry, the lowest replacement demand will be present at the same time demand.

Graph 19 The average age and share of employees aged 60 and over and pensioners in sectors of economic activities SK NACE Rev. 2 in 2020



Source: Calculations and processing by TRIXIMA Bratislava, ESA2010, ISCP

Graph 20 The average age and share of employees aged 60 and over and pensioners in SK ISCO-08 employment subgroups in 2020



Source: Calculations and processing by TRIXIMA Bratislava, ESA2010, ISCP

Today, and at least until 2040, the numerically weakest cohorts born after 2000 will enter the labour market. Therefore, a particular priority must be given to the area in which the labour force is educated and in which they are employed. In the future, given the scarcity of human resources, consideration will no longer be given to whether graduates will end up in employment or unemployment, but ***whether we have an adequate labour force structure to ensure further development in key areas and realise the vision formation of the labour market.*** This also implies that unemployment will naturally decline in the future.

In the SR, there is only a ***very weak link between the labour market and the lifelong learning system.*** Labour market information does not systematically enter the lifelong learning system in both quantitative and qualitative terms. This is why many graduates find jobs outside their education after graduation. One year after graduation, 64 % of high school students and 50 % of university graduates work in an area that does not correspond to their education. Of course, this is only the result of a deeper problem rooted in the isolation of the functioning of the education system in the SR from the labour market and the development of the economy.



A generally accepted development vision and strategy in the SR human resources into the future is absent, according to which further steps could be taken.

In the field of human resources, there is no clear vision of where the SR would like to go, and thus an acceptable list of steps that could fulfil this vision.

Slovakia has one of the largest expected impacts of automation and digitisation on the economy and the labour market, yet fundamental decisions are not taken. We expect the market to “resolve” it. Obviously, the market will work it out, but that solution may not be in our favour unless there is enough skilled labour force in the structure and quality that the rapid changes require.

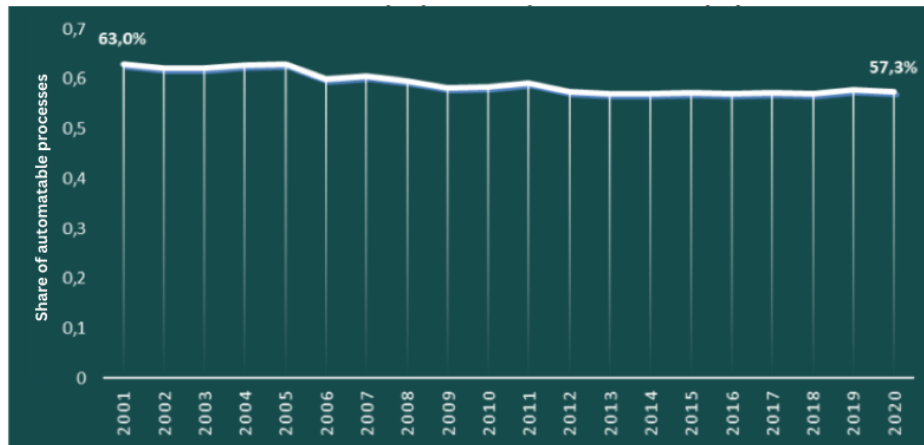
It is not difficult to determine which areas need to be developed for a better future. They are primarily **IT, automation, robotics, artificial intelligence, virtual reality, biotechnology, energy, and pharmaceuticals.** Of course, this does not mean that other areas are unimportant, but if Slovakia wants to become a leader in the future, it is necessary to choose prospective areas where it wants to excel.

The SR is among the countries with the highest rate of potential automation of work processes. According to the OECD, up to a third of jobs in the SR have a high risk of automation, and more than 60% of jobs have a significant potential for automation. The OECD ranked the SR in unflattering first place in automation potential among countries. According to information from TREXIMA Bratislava, it is possible that in the future, up to 57% of work processes currently performed by employees will be automated. The SR clearly belongs to the countries that await significant changes in the future associated with technological progress.

The extent to which processes can be automated depends largely on the economy's structure and jobs. If the economic structure is preserved as it was 20 years ago, approximately 63% of work processes would be automatable. Thus, the rate of potential automation is decreasing and will continue to decline in the future. Two factors can cause this decrease. Either automatable processes are automated, and therefore the need for human labour in occupations with a high automation potential or the labour market

structure is developing towards higher qualified positions. Although there is a decrease in the proportion of automated work processes in the SR conditions, it is impossible to say to what extent these two factors played a role. However, this share is decreasing slowly, and Slovakia is still waiting for the most significant changes.

Graph 21 The share of automatable processes in Slovakia, development in the period 2001-2020



Source: Calculations and processing of TRIXIMA Bratislava

It is necessary to realize that the main cost item of human labour is wages, which are the result of demand and supply in the labour market. **As long as businesses start implementing technologies substituting human labour on a larger scale at the same time, the demand for these will not be created workers elsewhere (in the economy of the SR), then at the same time the wage for which they are willing to work will decrease.** This will result in a further slowdown in technology implementation since human work will become more profitable for the enterprise than before the technology implementation. In fact, this natural market principle and profitable incentives for businesses will prevent automation and robotisation from extremely impacting the labour market and employees.

The problem is not the effect of automation in the labour market itself, which will increase but will not be impactful. Jobs will also be created with technological changes, and history teaches us that they are created to a greater extent than they disappear. **However, in today's globalised world, the new jobs required by technological progress can be created anywhere, at a different time from those that disappear, and, above all, will require different qualifications and skills.** Technological progress will advance a country on a global scale, but that does not mean that every country will benefit from it. Above all, if there is not enough qualified labour force to implement technological changes in the future, humanity will rather suffer than benefit from these changes.

Future labour shortages caused by demographic factors will push labour force costs up. On the other hand, rapid technological progress reduces the cost of technology and enables its implementation on a large scale. In other words, the labour force in SR conditions will become less and less competitive with technology. If the SR does not provide suitable qualifications and skills to the future labour force, so at the same time, the labour force will become less and less competitive for the implementation of these technologies.

Current and future trends, as well as strategic plans, must be implemented into the system of lifelong learning. Slovakia must prepare for the future in advance, not solve problems only when they arise.

In addition, if the current development continues, there will be a labour shortage, and the labour force will lack the necessary skills in the SR. Many skilled workers are leaving and will continue to leave the SR. The www.uplatnenie.sk (the so-called *Graduate tracking*) made it possible, for the first time in the conditions of the SR, to analyse the extent to which graduates go to study abroad and in what structure. This information can also be linked to study results. Thanks to that, we already know today that the "brain drain" in the SR conditions is not just a vague statement based on feelings but a reality that will take revenge on Slovakia in the future. It is also known that brain drain is not critical after entering the labour market but while continuing to study at the university. Up to 18% of graduates leave to study abroad, and approximately 70% of that to the Czech Republic.



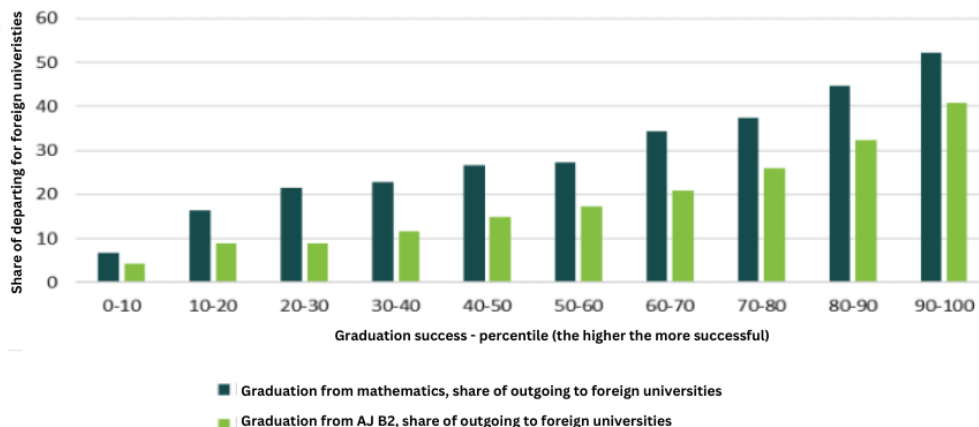
It is essential, however, that the best and most necessary for our future leave Slovakia to study abroad. For example, over half of the 10% of the most successful mathematics graduates in the SR leave to study abroad²¹.

In general, the better the results from the school leaving exam (maturita exam), the more graduates go abroad. So the best ones that we have at home are leaving. However, what these graduates go abroad to study is also crucial. More than 19%²² of them leave to study information and communication technology (ICT), while in the SR conditions, it is only about 8%. We have as many ICT students in the Czech Republic as in Slovakia. Approximately 10% of secondary school graduates leave to study natural sciences and 15% to study healthcare. Almost half of those going abroad to foreign universities are studying in the field of STEM, which is crucial for future technological and demographic changes.

²¹ The data is based on the connection of administrative data sources from the Graduate tracking [http://www.uplatnenie.sk/](http://www.uplatnenie.sk) and information about the success of the school leaving examination from NÚCEM (The National Institute for Certified Educational Measurements). This connection was implemented by the MŠVVaŠ SR (The Ministry of Education, Science, Research and Sport of the SR)

²² The data is for the Czech Republic, where the vast majority of high school graduates go to study.

Graph 22 The share of graduates leaving to study at foreign universities in terms of their success in the school leaving exam in 2018



Source: Processed by TRIXIMA Bratislava based on data from www.uplatnenie.sk and MŠVVaŠ SR

Technological advances and globalisation enable sharing of information, knowledge, and experience worldwide, opening up opportunities for new innovations, products, and services. While in the past the key question was “how?” to make a product or realise an idea, today it is increasingly worth answering the question “what?” – to create, deliver, and innovate. It is already available, and there will be even more tools to realise creative ideas, innovations, and new ideas in the future. The main value for society will be to develop and design these ideas. Therefore, the main skills/competencies of the future will be **creativity, innovation, and the ability to come up with new ideas**. These are, at the same time, skills/competencies that technology will never replace. However, the future and advanced technologies will largely depend on the data that becomes available in enormous quantities.



The ability to work with data, find key connections, create learning models, and interpret information simply and clearly.

It will also be important for companies to be able to distinguish their product from the competition, not only in terms of price but its implementation in the awareness of target groups. **Design and marketing skills** will be in demand across the entire economic spectrum.

In the further development of the company, **multidisciplinary and a general overview** will play a key role in implementing processes and knowledge from one area to another or connecting information from different disciplines. The development of the division of labour in the last century caused enormous economic growth efficiency and productivity, but at the same time, created a demand for a narrow specialisation of the labour force, which also adapted to the education system. This specialisation produced experts in isolated fields, thanks to which these areas could develop more quickly, and thanks to this, we owe today's progress. However, this progress was also largely isolated to individual areas. That's why linking different fields and disciplines has yet to reach its full potential in the past but will play

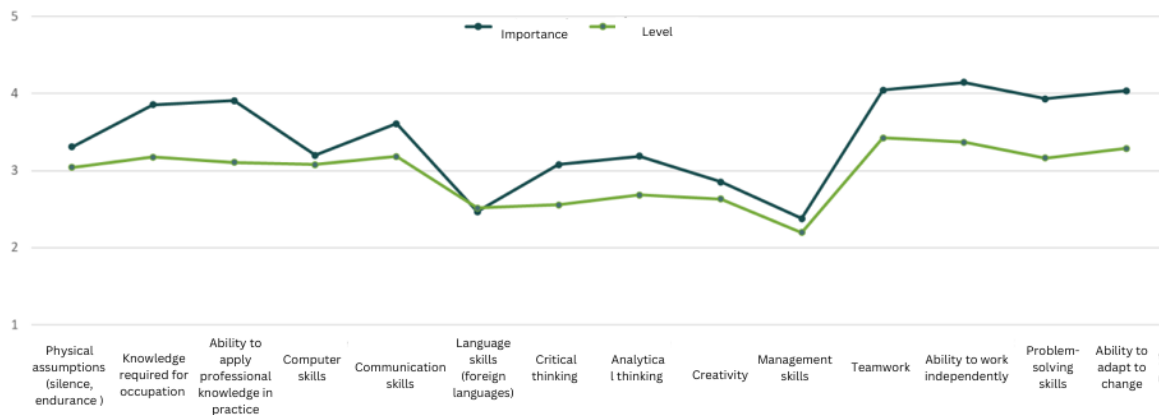
in the future key role. Along with multidisciplinary and rapid changes, the demand for **the ability to learn will also grow new things and flexibility, as well as the ability to work in a team and lead a team.** Information technology is the main connecting factor of the most important changes in the future.



Computer and digital literacy will not be a privilege but a necessity.

In the present, during the skills survey, **soft skills** have been identified as the most important across the entire economic spectrum and at the same time as those in which labour forces are most lagging behind expectations of the employers. However, only a small number of the skills mentioned above of the future can be learned from books or lectures. Therefore, **it is essential to develop and implement activities for lifelong learning systems supporting the development of these skills.**

Graph 23 The required skill level by employers and available skill level of graduates in the SR in 2019



Source: Calculations and processing of TREXIMA Bratislava

Currently, there are a number of processes that can be automated today, and yet they are not. This is effectively hampered by a lack of multidisciplinary, over-specialisation, and, above all, low broad knowledge of IT possibilities. For example, the IT worker does not control the economic processes taking place in the economic department, and the accountant is unaware of what current technologies are capable of. If an IT worker were to follow these processes, he would be able to automate many of them today. The accountant should know what is currently possible with the help of IT technology to automate and digitise and then initiate this change. For this, however, increasing **digital literacy across the board** is necessary, not just to specialise several hundred experts in these technologies.



If specialists in various fields will become more computer literate and, above all, they will know

the possibilities of IT, it will significantly escalate the company's technological progress.

The same applies to, e.g., even with artificial intelligence and machine learning, which are currently understood as a privilege IT. However, it is actually a set of statistical methods and interferences that lead to the acceptance of automatic artificial "smart" decisions. Robust statistical and programming skills are thus essential for their development. However, few statisticians know how to programme at a sufficient level, and few IT professionals master statistics at an adequate level for the relevant development of these systems. A statistician can make a decision based on applying a statistical method; however, it cannot automate decision-making into a system. **Therefore, multidisciplinary cooperation and increasing digital literacy are key to success in the future.**

Regarding European policies, digital 'citizen' skills/competencies are relevant within **The Digital Competence Framework for Citizens (DigComp 2.1)**, which classifies the levels of control and functionality of digital skills (basic, moderately advanced, advanced, very advanced).

Other sectoral reference frameworks also resulted from DigComp 2.1, such as:

- DigCompEdu for educators;
- DigCompOrg for educational institutions;
- DigCompConsumers for consumers;

Ad hoc classifications for skills related to **the Information and Communication Technologies (ICT) sector** have also been developed at the European level. The most relevant work in this area is **the e-CF(version 3.0), a common European Framework for ICT Professionals in all sectors**. This framework gathers five areas of competence related to corporate organisational processes (planning, building, operation, authorisation and administration). Each process is combined with different specific skills, which are then divided into different levels (compatible with the European Qualifications Framework levels 3-8).

The ESCO international classification represents a pan-European taxonomy of skills, competencies, qualifications, and occupations translated into 27 languages. ESCO also includes 5 subgroups focused on digital skills (ICT security, digital data processing, communication and collaboration through digital means, using ICT hardware and tools to solve problems, and creating digital content), which are on the list of a total of 21 skills, defined as "cross-cutting," but still digital.

In order to create educational systems, the European Union **included digital skills among the 8 key elements of lifelong learning**. This element of **the European Framework of Key Competences for Lifelong Learning**, revised in May 2018, includes: computer and digital literacy, communication and cooperation, media literacy, digital content creation, security, intellectual property issues, problem-solving, and critical thinking. Digital competence, therefore, above all, assumes an interest in digital technologies and their use, knowledge of procedures used, and a critical and conscious approach that promotes education, work, and participation in society.

In order to promote innovation, economic growth, and progress, among other things, it is necessary to **improve literacy and inclusion in the digital world, go beyond the 'basic level' of digital skills** and develop critical and conscious use of new technologies.

A 'multidimensional' national map for digital skills

The areas of intervention combine and show graphically through two axes which generally reflect the weak points of Slovakia:

- The axis of the development of digital citizenship skills and soft skills, cross-cutting and supporting (creativity, problem-solving, critical thinking, etc.) associated with new technologies, according to the DigComp framework - to satisfy the needs of every citizen of the information and communication society: the need to be informed; to communicate; to comment; with access to cyber protection; critically use technological tools in a digital environment.
- The axis of strengthening vertical technical skills corresponds to a more specialised area, which develops the technical skills or so-called hard skills that enable individuals to identify, evaluate, use, share, and create content using information technology and the internet. These skills are more specific and advanced (e.g., coding or developing AI software systems).

In order to be able to act under the **first axis**, it is necessary to intervene by measures targeting the population as a whole and not just students, to upskill and reskill, using schools and training centres with digitalised learning spaces to enable collaboration, sharing, dissemination of innovative methodologies and approaches to learning. It is, therefore, necessary to work to build the skills to enable the use of digital tools but also to develop the basic digital capabilities, which are now essential for exercising “non-digital” professions.

To engage in the intervention of the second axis, the spread of STEM (science, technology, engineering, and mathematics) of knowledge, connecting the content of education with the needs of the labour market, seeking the involvement of companies and external education and training experts, providing updates for of teachers of "professional" and technical subjects, provision of state-of-the-art laboratories/workshops, equipment cutting-edge technologies, etc.

The World Economic Forum lists the top 10 most essential skills for the labour market as follows:

Figure 2 Top 10 Skills of 2025



Source: World Economic Forum the Future of Jobs Report 2020²³

As already mentioned above, the impact of innovation trends will also have a significant impact on the social status of society. Accumulation of older people in the labour market, the lack of a domestic labour force, the change in the working conditions, and others will create enormous pressure to take well-targeted measures both at the level of the SR government and at the corporate level.

²³ <https://www.weforum.org/reports/the-future-of-jobs-report-2020/in-full/infographics-e4e69e4de7>

CHAPTER 3

The social impacts and the expected qualitative changes in the field of the labour market and human resources

3. THE SOCIAL IMPACTS AND THE EXPECTED QUALITATIVE CHANGES IN THE FIELD OF THE LABOUR MARKET AND HUMAN RESOURCES

The application of innovative trends and technological changes in the economy of the SR calls for parallel changes and also in the setting of new labour market conditions so that the transition to the changes is smooth and has a positive impact on the development of the economy as a whole. This presupposes the anticipation and subsequent realisation of necessary changes in the social sphere, harmonisation of work and family life, definition of the needs of qualified individualised education and personal development of workers, the introduction of necessary legislative changes in employment and social areas related to the setting of an effective labour market by 2030+.

The gradual introduction of innovative trends and the application of technological changes in the national economy of the SR is affected by the following:

- unfavourable demographic development until 2060,
- the absence of an effective migration policy aimed at existing labour market disparities,
- the lack of age management,
- a non-conceptual family policy,
- the absence of innovative approaches at all levels of education and personal development

These impacts shape future political, economic, and social challenges over at least the next two decades. In this context, it is necessary to design and implement in an effective sequence a number of changes in the social sphere, legislative changes affecting the field of employment, family life and harmonisation of work and family life, changes in social security, employment services and, where appropriate, related social assistance.

In relation to the social impacts that will be triggered not only by the demographic development but also by the simultaneous impact of the introduction of technological changes and innovations affecting employment and the disappearance and creation of new jobs, it will be necessary to turn efforts towards the establishment of national policies aimed at:

- the support for employees and self-employed people currently operating in the labour market (changes in labour and legal conditions, the support of continuous individual education and personal development, ongoing acquisition of current professional knowledge and skills in relation to innovative changes in the labour market and in the workplace);
- the effective support of the demographic growth (assuming impact from 2040 at the earliest), targeted family policy and related social policy of the state (e.g., also housing policy in depopulated regions), a targeted migration policy at least for professions currently in short supply labour market; harmonisation of work and family life);
- the stabilisation of the labour force, prevention of unwanted brain drain and unwanted drain of employees in scarce professions (healthcare professions, ICT professions, electrical engineering, agriculture) to other EU/EHP member states, or even outside of European space;
- equalising geographical differences within the country, preventing the depopulation of areas;
- the support for retaining employees aged 60-70 in the labour market (effectively targeted age management, seniority programmes within employment, labour law changes taking into account other physiological and psychological needs of older employees, etc.);

- the social security, such as family support (social insurance concerning individual types of social insurance benefits, e.g., area of sickness benefits: pregnancy, maternity mother's and father's, sick and nursing allowances; area of family benefits), the support for the elderly citizens (e.g., a special social insurance benefit in case of need for nursing services, etc.) and state family social benefits;
- the inclusion of long-term unemployed and/or disadvantaged individuals in the labour market of social life within communities (social support system), or incorporating the inactive of individuals of productive age to the labour market offer;

The above-outlined measures assume a complex, interconnected system of changes. **It is also necessary to recall the necessary change in employment policy settings, in the relationship to disparities in the labour market, the transition of the focus of employment services from solving unemployment to addressing support for the competitiveness of employers and employees during the implementation of innovative changes, support for their individual education and adaptability in the labour market.**

Addressing the ageing of the population and a lack of quantitative and equally qualitative replacement of the labour force in the labour market of the SR, and the associated gradual reduction competitiveness of the country concerning innovative changes, as well as the standard of living appears to be a significant and severe problem, especially for the next two decades.

The ageing of the population, the prolongation of its average life expectancy, and the increase in the proportion of older people in the Slovak population will have long-lasting consequences in case of delayed or insufficient access to this issue. Already, the ageing population affects society – in the pension system, where pensions are subsidised from the state budget, which will be a severe deficit problem in the future. In the area of health, the need for a change in access to healthcare and expenditure growth will also be an essential challenge.

Administrative measures, such as, for example, increasing the retirement age, will not have the desired impact if they do not coincide with measures to support a (radical) increase in birth rates. The birth rate in the SR is also below the average European level. On the other hand, there is still a relatively high unemployment rate, which is still below the average of the EU Member States. The unemployment rate in Slovakia is still high compared to other EU countries, even after the overall unemployment rate has fallen below double digits. At the same time, the imbalance concerning labour market needs has persisted since 2018, with structural labour shortages that are not compensated by a targeted migration policy but “only” by imports of labour from third countries (non-EU).

The labour market in Slovakia is and will be further influenced by the high openness of the Slovak economy and related globalisation processes, as well as by the gradual introduction of innovative changes and technological processes. At the same time, attention must be paid to supporting workers in the labour market, young people entering work, and keeping older workers at the best possible performance levels.

However, for the next two coming decades, priority is needed to set a policy to increase the birth rate, as the measures currently in place will only have an effect within 15-20 years. Higher birth rates must be linked to the implementation of several national policies, primarily family policies and the setting up of an effective social security system (addressed non-discriminatory social benefits, family benefits), successive employment policies, housing policies, and harmonising regional policies (to prevent the even more significant deepening of regional disparities and depopulation of areas). Thus, the transformation

of family policy presupposes synergies at both national and territorial levels. Long-term sustainable economic development presupposes a sustainable birth rate, with the appropriate birth rate considered to be 2,11 as the maintenance value in the population.

If there is no improvement in the birth rate in Slovakia in the next five to seven years, long-term deterioration of both quantitative and qualitative aspects of human resources can be expected in the future, with negative consequences for several areas of the development of the Slovak society (increasing labour shortages, deterioration of the qualitative structure of the workforce, problems with the financing of pensions and health care, etc.).²⁴

In recent years, the EU institutions have also been paying comprehensive attention to family policy. In 2017, the European Commission presented the European Pillar of Social Rights at a summit in Sweden, which foresees 20 basic principles aimed at reconciling family and working life. The fundamental premise of European policies is to believe that a more effective reconciliation of work and family life will encourage parents to decide to have more children in the family so that the birth rate is at least 2.0.

Slovakia primarily addresses two parameters within the framework of solving the issue of increasing birth rates and ensuring the labour force's quantity and quality.

The first parameter refers to the general evolution of the birth rate, respectively factors of population development. This includes the development of birth rates and the growth of the emigration of the population from Slovakia to abroad, i.e., the emigration of working-age individuals for long-term employment opportunities, as whole families with children. The number of children from Slovakia emigrating abroad with their parents is unknown; they are expected to reach higher values (no statistics on this have been reported since 2012).

The second parameter deals with the overall characteristics of born children by education, age, and nationality of the mother. It is necessary to specify the objectives of family policy further to achieve the desired development of the labour force in a period of increasing demands on the quality of human resources and their adaptability in the labour market. Family policy must meet several objectives in parallel:

- to reach the necessary level of birth rate;
- to eliminate child poverty and social exclusion and reduce the material deprivation of families;
- to support the integration of parents into the labour market following the reasonable harmonisation of family and working life;

In the coming years, the SR has an urgent need to address, in particular, the low birth rate, which is currently far below the reproductive value, i.e., not even the average birth rate of the EU Member States, and we have been among the EU countries with the lowest cumulative fertility rates for a long time. It is clear that (also taking into account the situation in 2020) with the current low number of births or low birth rates, the total population of Slovakia is also gradually decreasing.

Even the evolution of emigration, meaning the departure of a relatively large population from Slovakia to abroad, is not favourable for the development or stabilisation of the labour force in Slovakia's labour market.

²⁴ Hvozdíková, Lichner et al., 2018

The highest number of Slovak citizens at the beginning of 2017 lived in the Czech Republic (107,400), the United Kingdom (102,800), Germany (49,600), and Austria (38,100). According to Eurostat data, over the three years (2014-2017), the increase in the number of Slovak citizens living permanently abroad was 64,300 (290,900 in 2014 and 355,200 in 2017)²⁵.

Table 11 The current and ideal number of children in the family (women aged 25 to 39)

	Number of children		
	current	ideal	additionally intended
IE	1,65	2,74	1,09
FR	1,62	2,60	0,98
EE	1,50	2,44	0,94
HU	1,52	2,31	0,79
SE	1,28	2,29	1,00
LV	1,56	2,27	0,70
LT	1,30	2,19	0,89
EU 28	1,29	2,11	0,82
SK	1,23	2,03	0,80
PL	1,27	1,98	0,71
CZ	1,30	1,95	0,65
BG	1,24	1,93	0,69
IT	0,80	1,85	1,05
RO	1,19	1,78	0,59
AT	1,07	1,74	0,67

Source: OECD, Family database; Eurobarometer 2011: Fertility and Social Climate

In the conditions of the SR, differences in birth rate factors between social groups (high-income, low-income, with higher qualifications, lower qualification, etc., including ethnic, national, or cultural differences of individual social groups) are also special and based on these specifics, it will be necessary to consider and propose changes to the conditions and the amount of payment individual social and family benefits.

From a sociological point of view, it is also necessary to consider, within the parameters of family policy, the fact that there is a difference between the number of children born to one woman and the number of children that a woman would like to (could) have.

The birth rate, but also the future unemployment rate or the future number of skilled labour in the labour market, is affected, as a specific specificity, by the age structure of mothers. A high level of adolescent birth rates characterises Slovakia. Adolescent birth rates in Slovakia have been on an increasing trend since 2004. The value for Slovakia has risen since 2004 from 20.32 to 26.18 live births per thousand women of this age group in 2016²⁶. This conversion is about 6 % of all births. Adolescent birth rates largely explain the birth rates of girls from socially excluded communities. The high adolescent birth rate is due to the unfavourable economic conditions resulting from high unemployment, the hopelessness of young people, and the replacement of income from work with income from the social system, of which family benefits account for a significant part. The state continues to pursue a family policy that promotes the high birth rate of young women from socially excluded communities through the setting of family benefits. A factor in the growth of adolescent birth rates in Slovakia is a high childbirth allowance and a high parental allowance. When two levels of parental allowance are

²⁵ Hvozdíková, Lichner et al., 2018

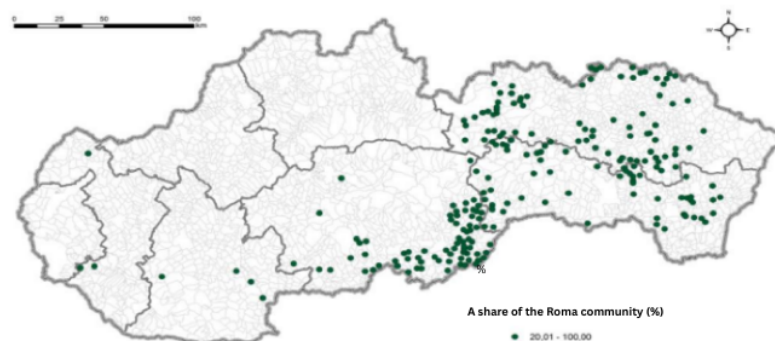
²⁶ Hvozdíková, Lichner et al., 2018

abandoned, the parental allowance is paid at the same rate to all mothers (or one of the parents) regardless of whether they worked before birth or not. Furthermore, if the mother is not entitled to social insurance, she receives a maternity allowance in the amount of the parental allowance immediately after childbirth. Setting the conditions for the payment of family benefits directly forces young women from socially excluded communities to give their first childbirth as soon as possible, to receive parental allowance, and immediately after that (after three years the three years of entitlement to parental allowance or earlier) to further confinement under the same conditions. Moreover, in the age group of 15- to 19-year-old mothers, more than one-third of women gave birth to their first and second child at this age. These first (and other) deliveries are for young people (largely underage women) unsuitable from the point of view of their future vocational training, which remains for women-mothers with a child incomplete not only at the second stage but many times at the first stage as well school education²⁷.

Another specific necessity for adjusting changes in the concept of family policy is the differentiated development of birth rates of the majority and Roma minority. The maps below show that the growth of the Roma minority will also be one of the determining factors for the future labour market in the SR. A comparison with the results of the 2021 SODB census will be interesting. (the results have not yet been published.)

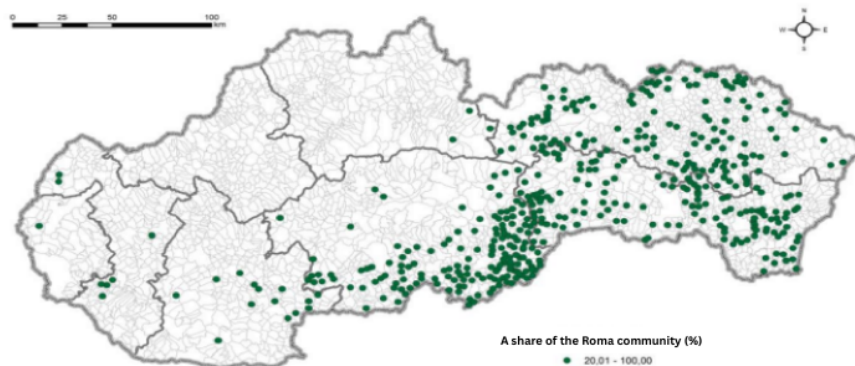
²⁷ Hvozdíková, Lichner et al., 2018

Figure 3 The map showing locations with a share of the Roma community in the municipality above 20%, the year 1980



Source: RNDr. Martin Šuvada, PhD., 2016

Figure 4 The map showing locations with a share of the Roma community in the municipality above 20%, the year 2013



Source: RNDr. Martin Šuvada, PhD., 2016

It is also necessary to evaluate in the future parameters of the family policy setting the fact that the share of costs of the SR on family policy decreased from 2.5 % of GDP in 1995, with more minor fluctuations, it oscillates around 1.7 % of GDP today. Since 2004 (the period of setting the legal conditions before Slovakia acceded to the European Union), there has also been no substantial change in the structural distribution of family cash benefits, in particular, the promotion of an increase in birth rates, in any way (except for the valorisation of cash benefits).

According to Gauthier, since the 1970s, the family policies of individual countries have faced four significant challenges. As a first challenge, it is possible to mention changes in family structure, a decline in birth rates, postponement of parenthood, an increase in divorce rates, an increase in the number of

incomplete families, an increase in non-marital cohabitation, an increase in women's participation in the labour market.

These changes have been observed in all industrialised countries, although the course and extent of these changes have been markedly differentiated. The country's family policies reacted differently to these changes, but in general, it was mostly about increasing support for working parents. In particular, many countries have emphasised the so-called "pronatalist model of family policy." At the heart of this model is the low birth rate. **For this reason, the main task of this type of family policy is to encourage families to have children, in particular by promoting the reconciliation of mothers' work and family life.** The main focus is on promoting maternity leave and facilitating childcare **by increasing the availability of preschool facilities at an affordable price.** Conditions for parents are created so that the birth of a child is not an obstacle to the later application of a woman – the mother of a child of preschool age.

According to Tvéneon (2011), the following six primary policy objectives for family support exist per country:

- poverty reduction and income maintenance;
- direct compensation of children's economic costs;
- employment support;
- improving gender equality and equal opportunities;
- encouraging early childhood development - participation of parents in raising and educating children;
- institutional preschool education;
- increase in the birth rate;



Suppose there is to be a more fundamental reversal in the development of the birth rate as a precondition for a more even development of labour resources. In that case, the company must improve family policy throughout its structure.

The upbringing and education of children and young people must be placed at the heart of the state's economic and social policy.



The family policy should aim to promote more equal population growth across all sections of society (income, education, national, ethnic, urban, rural, etc.), which must be done in a non-discriminatory manner.

However, this does not mean that, as is the case until now, undifferentiated family benefits must continue to be maintained in terms of the child's age, disregarding the family's income level. High, even extreme birth rates in socially excluded Roma communities cannot persist for a long time in some

regions of Slovakia, as this only worsens the average income in their households per member, prolongs the state of the poverty trap, and indefinitely postpones the time horizon of their social inclusion. High birth rates in these communities and associated family benefits should not be the dominant source of income. At the same time, the birth rate of the majority population should be increased by supporting especially the second child in the conditions of ever-shrinking families in Slovakia and the motivation of future mothers to work already before their first motherhood. The support and growth of the total birth rate are related to the sustainable development of regions, with the stability of job opportunities, by a more even distribution throughout Slovakia.

The starting point for a positive turnaround in the birth rates should be the adoption of a new family policy in the conditions of the SR, and the primary objective in the field of birth rates should be to achieve at least the average birth rate of the EU Member States. In order to halt the ageing of the population and support the development of domestic labour resources, the competitiveness of the economy, and success in the processes triggered by innovation changes, it is also necessary to ensure effective synergies between other national policies, such as targeted employment, education, regional development, and social housing policies.

In the context mentioned above, in the interests of a successful family policy, it is also necessary to address the parallel adjustment of further changes in the social sphere, in particular in the harmonisation of work and family life, targeted support for adult education and, therefore, parents when returning to the labour market after a longer break of time, and related legislative changes in the field of employment.

The changes in the labour market conditions are also appropriate for the necessary competitiveness of the SR economy and, therefore, for the competitiveness of the labour force in the labour market, changing under the impact of the upcoming fourth industrial revolution.

Primary changes should consider the needs of young families and childcare requirements and, consequently, the specificities of integrating parents (primary mothers) into work, returning to the rhythm of work after a break.



As a part of the family policy, it should be a priority for the state to focus on the social conditions of families, on supporting future mothers to have their first work experience before the first childbirth, and then on appropriate employment conditions for parents of minor children, especially children under the age of three.

The SR is characterised by one of the most extended periods of maternity leave or parental leave within the care of children up to three years of age, while setting the parameters of maternity leave is optimal, reaching almost 100 % of the wage net. However, social security during parental leave is no longer so favourable. Concerning the promotion of optimal birth rates, particular attention must be paid to working parents who care for their children and provide them with material security to avoid severely unfavourable financial conditions. It is also necessary to legally treat the special requirements of parents not only during their employment but also in the context of pension schemes (also due to adverse demographic developments). Given the high rates of extra-marriage **births (approx. 40 % according to**

the Statistical Office of the Slovak Republic in 2018) and also the high divorce rate, specific approaches and labour regulations are required by single parents, as they experience more significant difficulties in reconciling work and family life (e.g., a part-time job is time-satisfactory for the single parent, but in financial terms security is insufficient).

It is also necessary to take into account the specific needs of the parent/parents upon return from maternity leave or parental leave to enable them or employers to carry out certain forms of ‘adaptive process’ on return (adjusted working conditions, working time fund conditions, entitlement to ‘update training,’ etc.). In some Member States, the concept of “reducing working hours in certain life phases” or “multi-annual working time accounts” is introduced, where the employee could store overtime hours or residual leave on a “time account” and choose later more extensive periods of time in mutual agreement with the employer in order to harmonise work and family responsibilities.

In the Slovak legal system, various institutes are used to reconcile work and family life (e.g., part-time jobs, working time arrangements, split jobs, work-from-home (domestic work, teleworking) variations in setting the working time).



The currently emerging labour market changes concerning Industry 4.0 will also require future changes in the current legislation of the Labour Code.

The Labour Code currently regulates:

- the part-time employment relation, which can be agreed upon in various forms, including in the form of the so-called compressed working schedule or as work performance for several hours during working hours days (§ 49);
- the divided workplace (§ 49a);
- the increasingly used institute of work-from-home and telework (§ 52), the adjustment of working hours (§ 164, paragraph 2);
- the special conditions for overtime work or parental emergency work (§ 164, paragraph 3);
- the many variations of flexible working hours (§ 88);
- the split work shift (§ 90, paragraph 6).

The state should participate in motivating and supporting employers so that they know and use flexible forms of employment for parents of minor children and implement them appropriately (e.g., within the flexible working time institute, it is possible to agree on different work regimes, and how beneficial it would be to consider changing the flexible working time regime and obstacles at work so that obstacles at work in the case of parents of children were included in working time - § 143 of the Labour Code).

The setting up of other labour law institutes must also be anticipated concerning new working conditions (as it currently appears, e.g., work on platforms), requirements of occupational safety and health protection at work (e.g., there is no legal regulation of OSH conditions for performance of work-from-home), it would also be practical to specify the existing legal regulation of working conditions concerning the use of new technologies, parallel adaptation training of employees, etc.

In an effort to optimize the quality of people resources, a certain circle of employers (medium and large employers) tries to motivate parents to work (even on a limited basis) in addition to taking care of children regime, so that their knowledge and skills do not degenerate, but are maintained), or they are educated. Subsequently, after the end of maternity/parental leave, they start work ready to perform the job (toward the end of maternity/parental leave, they will agree on adaptation processes with the parents, gradual training, intensive courses, etc.). In this case, an intervention would also be appropriate for the state, which should support, promote and financially evaluate employers with a pro-family benefits approach. However, in order to be able to, for example, work in a certain limited mode even while downloading maternity leave, it is necessary to change the legislation in this regard. At present, there is such progress in many jobs (including in relation to Industry 4.0) that if a parent is, for example, on maternity/parental leave for three years or if he has more children, he/she is unable to start working in the position he/she left immediately after the end of the maternity/parent leave. Although this job is named the same, the content of work activities is changed. There are situations where the parent cannot handle the new setting of the processes; they cannot be done quickly and often leaves the employer. Of course, there are also known cases where the employer changes the organisational structure due to the change in the contents of the jobs. After the end of maternity/parental leave, the parent actually becomes redundant because he does not have the skills, knowledge, or skills that are necessary for the newly set positions (it is not unusual if such organisational changes are contrived and especially because the employer is not interested in the training of an employee returning from maternity/parental leave and prefers to stay an employee who currently works for him as a substitute employee during maternity leave holidays).

The protection of parents, which concerns their return to work, is guaranteed by § 157 par. 2 and 3 of the Labour Code, which, however, often becomes unfeasible in practice precisely because of the abovementioned reasons. **Therefore, exactly with the setting of conditions for Industry 4.0, employee education appears to be crucial and precisely for the category of employees - parents; it is the tool that will return them to the workplace to the original employer, but with "updated" professional knowledge and skills.**

In addition to the possible possibility of working or studying during maternity/parental leave, it would be possible to consider **enhanced protection, e.g., for a period of three months after the end of maternity/parental leave**, during which the parent-employee would have the right to receive training innovative skills in the form of education or adaptation practice. So that parents can immediately after the end of maternity/parental leave to work effectively, as an important tool for retention and raising the qualifications of employees - parents during maternity/parental leave can be perceived as **offering the possibility of education, acquiring new skills through short-term internships, regular meetings within the collective**. These are activities that are also time-consuming coordination. It is not the aim to present examples of good practices of specific employers funded from their internal resources. Still, it would be appropriate to consider general support tools employers, e.g., targeted financial support through labour and social affairs offices and families. Education or the provision of various training would be set by the employer administratively simple project (individual specification education in agreement with employees).

If training, the acquisition of the necessary knowledge and skills were costly and the State would not support the employer in any way (if there were state participation, this would be deducted from the employer's costs), it is possible to consider the use of **an agreement on deepening qualifications** (§ 155 paragraph 5 of the Labour Code) when the employee would also undertake to stay for a certain period of time at the employer. However, it seems risky that he would discourage employees from concluding

such a contract agreement, the obligation to pay the costs if he does not stay with the employer for the agreed time. Maybe it would be appropriate in the Labour Code **to set maximum periods of stabilisation obligation** depending on costs (or depending on the average monthly salary of the employee). Such a setup could be welcome not only in the case of parents but in general for all employees for whom the employer provides a deepening of qualifications or provides them with various types of on-the-job training. If, indeed, the employer requires staying in the employment relationship for five years for a relatively low cost, it is disadvantageous for the employee. The Labour Code has a set period of stabilisation obligation as the maximum, but in practice, it is more inclined to propose a maximum time.

An important factor determining whether a parent will start work or take care of a child personally is **the availability of preschool facilities** near the employer's headquarters or the parent's place of residence. The lack of such facilities is seen as an obstacle to an earlier return to work.

Part-time work is seen as a frequent example of reconciling work and family life. However, this is used to a low extent in the conditions of Slovakia, also due to the lack of preschool facilities, even for the low level of remuneration. For many employers, this form is unsatisfactory (e.g., the manufacturing sector). A pro of employment for shorter working hours also perceives the higher efficiency of the work of employees (who seek to use working time at a higher pace of work than employees on established weekly working hours). These forms of work are used for employers who provide services, e.g., in the field of IT, industry, and telecommunications.

A more precise legal arrangement for the start and end of maternity/parental leave would make it possible to enshrine **the minimum duration of taking the minimum parental leave** (e.g., in the case of parental leave for at least two months) because, in practice, there are situations, where the employee draws parental leave, e.g., five weeks, then decides to return to work and then in a few weeks, retakes parental leave, which complicates matters for the employers to operate. Employees often do not comply with the one-month notice period (§ 166 para. 3 of the Labour Code), the employers thus find themselves in uncertainty, and therefore be appropriate to include a minimum period of parental leave (e.g., two months), even in the case of interrupted parental leave **or setting a specific period between the notification of starting work and the day of starting work, which would have to elapse after the notification.** This clarification would improve the position of employers.

Possible help to the child's mother could be perceived through **the institute of work leave**, which would provide the child's father with, e.g., within five days after the mother's return from the maternity ward. The objective of this leave would be joint parental care of the child and simultaneous care of the child's mother. This work time off could be an obstacle in paid work, e.g., from social insurance, e.g., nursing allowance intended for the father.

Another topic for changing the legislation taking into account childcare is **the possibility of sending a pregnant woman, a breastfeeding woman, or a parent of minor children, e.g., up to the age of 15, for a business trip, only with their consent** (current legislation in § 57 of the Labour Code is set to the disadvantage of parents), while such consent should be individual for each work trip (not a general clause in the employment contract).

Another topic for changing the legislation taking into account childcare is the possibility of sending a pregnant woman, a breastfeeding woman, or a parent of minor children, e.g., up to the age of 15, for a business trip, only with their consent (current legislation in § 57 of the Labour Code is set to the disadvantage of parents), while such consent should be individual for each work trip (not a general

clause in the employment contract).

The Labour Code generally allows employees to adjust their working hours in § 90 par. 11 Labour Code. According to this provision, if the employer's operation allows it, the employer is obliged to allow the employee, at his request for health reasons or for other serious reasons on his part, to make appropriate arrangements for the specified weekly working time or to agree with him, under the same conditions, in an employment contract. In practice, this provision causes problems in interpretation, which means a serious reason on the employee's side and which means that the operation of the employer allows it. Even jurisprudence does not provide a general interpretation applicable to specific exceptional cases and conditions of the employer. It would therefore be appropriate to specify this legal institution in the Labour Code.

Subsequently, § 164 par. 2 of the Labour Code enshrines a special provision for adjustment of working hours in relation to employees - parents. If it is a special regulation, it should take precedence over § 90 par. 11 of the Labour Code. According to this particular provision, **if a pregnant woman and a woman or a man permanently caring for a child under the age of 15 with shorter working hours or another suitable adjustment of the specified weekly working hours, the employer is obliged to comply with their request if serious operational reasons do not prevent this.** In practice, the application of the definition of “serious operational reasons” (compared to § 90 paragraph 11 of the Labour Code) poses a problem, and the employer should not comply with the employee only if, for serious reasons, he cannot accommodate the employee when adjusting working time. Given the increased protection of employees – parents, a solution would also be appropriate to allow the employer to discuss these reasons with workers’ representatives (similarly to § 142 paragraph 2 of the Labour Code). Although this is a claim of the employee/parent, which can be enforced in court, it is rather unrealistic in practical application on the employee’s side.

Regarding the unfavourable developing forecast of the labour market concerning the current demographic situation and also its adaptability to the fourth industrial revolution, it is appropriate to also set up the labour and legal environment in the conditions of the SR, taking into account the specifics of the work performance of the elderly employees, respectively settings for their smooth transition from active work to the retirement phases.



Within the framework of the employment policy of older workers, there is no comprehensive concept of age management in Slovakia.

Within the framework of a controlled process, it would be appropriate if state policies focused mainly, but not exclusively, on the gradual departure from employment and transition to the retirement phase of an older employee, also taking into account the necessary transfer of knowledge, professional skills and the specifics of the employee concerned as part of the process of ‘experience transfer’ to younger employees.

Leaving a job and transitioning to retirement should be an individual process set up according to the disposition of the relevant employee. It is appropriate to regulate the employee’s transition to part-time work (e.g., based on age or length of service in general). **Retirement planning should be part of the overall development of human resources within the employer and part of the employee’s managed**

individual progression. Employers can participate differently; emphasis should be placed on enabling the employee's targeted lifelong learning to keep the employee in good physical and mental condition; creating space for personal development; motivating employees to take an active approach to life and preventing burnout syndrome. It is important to allow the gradual transition of employees into retirement in the following steps: e.g., by respecting the physical and mental condition of the employee by reducing working hours; arrangements allowing for flexible working hours; agreements on the performance of work-from-home, etc. In particular, flexible working hours are also suitable for older workers in order to reconcile work, personal, and family life. These are different legal institutes, such as part-time employment, job sharing, different forms of flexion, work-from-home, or a balanced division of work as part of the transfer of work experience between the senior and the 'emerging' employee. It would also be useful to reflect, in the conditions of the Slovak Labour Code, on the possibility of various forms of contractual arrangements, such as the agreement on flexible retirement (e.g., partial retirement, combining pension and work), various forms of work from home adapted to the conditions of older employees, preventing fatigue and ensuring sufficient time for recovery.

Technologies are a key driver of new forms of work

While the previous extension of employment options to part-time and fixed-term employment influenced technological change only partially (OECD, 2019a), the role of the latest wave of technological development in facilitating the emergence of newer forms of work is evident. Technologies primarily lead to more vital standardisation of work while facilitating the filling of jobs and reducing monitoring and supervision costs. They provide employers with opportunities to outsource tasks while allowing workers to work remotely, either as employed or self-employed.

Table 12 New forms of jobs induced by technologies

A new form of work	Description	Examples
Employee-focused forms of work	They are not limited to the traditional framework of a stable employment relationship “one employer – one employee”.	<ul style="list-style-type: none"> • sharing of employees • job place sharing • occasional work • interim management
Forms of work focused on self-employment	Self-employment opportunities activities within which virtual platforms mediate customer contact with service providers as well as form cooperation between freelancers. For example, group employment applies to the use of online platforms to enable organisations or individuals access to an unlimited group of other organisations or individuals for solutions to specific problems or the provision of specific services or products for retribution.	<ul style="list-style-type: none"> • portfolio work • group employment • employment based on cooperation
Mixed forms of work	Forms involving workers whose employment status constitutes something between an employed and a self-employed person and, depending on the case, can be classified into one of these two categories.	<ul style="list-style-type: none"> • work based on assigning work through a work-flow system • mobile work based on ICT

ICT-based mobile work carried out by workers (whether employees or self-employed) from different locations outside the employer’s premises is gaining attractiveness in most EU Member States. Similarly, self-employment based on digital and collaborative forms of work is rapidly spreading. **The pandemic has significantly strengthened this type of work.**

Digital platforms can be one of the factors supporting the rapid increase in the number of highly qualified entrepreneurs. Self-employed individuals without employees (i.e., sole traders) account for more than 70 % of all self-employed individuals in the EU. The number of sole traders providing specialised intellectual or technical services has increased significantly over the last decade.

The common link between innovation trends, unfavourable demographic developments, and the modern social environment are thus massive changes and impacts in the labour market, which require immediate measures to stabilize and develop human resources. The very fact of adopting these changes is, in many cases, a longer process. All the more urgent is the call to take fundamental measures for the

managed development of human resources if Slovakia wants to achieve that every citizen, as part of our community, will be ready to accept changes, adapt to them, change their behaviour, attitudes, develop their knowledge, skills, and competences.

CHAPTER 4

**The proposal of necessary key measures
for employment restructuring in the 2030+
horizon**

4. THE PROPOSAL OF NECESSARY KEY MEASURES FOR EMPLOYMENT RESTRUCTURING IN THE 2030+ HORIZON

The common denominator of all three previous chapters is that they start from an assumption of three megatrends that will influence the labour market in the SR in the horizon up to 2030+: innovations - demography - the social state of society. These are the basis for processing the objectives and the structure of the key measures to fulfil the expected labour market needs in the individual years of the third decade of the 21st century in Slovakia. This means that it is not just about meeting the objectives in the time horizon up to 2030+ but also about creating system prerequisites for a flexible reaction of the labour market for a competitive SR on a European and global scale. Employment restructuring is only one component of several others affecting the balance of the labour market. **The systemic, necessary key action measures aim to create the conditions for measures to master technological, demographic and social change in favour of an efficient market with attributes of decent work.** Building the systemic coherence of key measures is based on a logical link between dominant policies that form the essence of employment policy. This should be a principle, including institutional anchoring and targeted effect, to create a competitively capable human resource structure and supply and demand in the real labour market. These relationships can be schematically illustrated as follows:



The diagram shows that the feasibility of key employment policy measures is related to the institutional provision of economic policy, educational policy, and social policy and their mutually balanced and effective interaction. This scheme also points to the fact **that the conceptual employment policy** is about the interdependence of several policies. **It is a cross-sectoral policy** that results from at least the medium-term strategy of the government (horizon of 5 to 10 years) created in close contact based on **the social dialogue**.

According to this study, the employment policy should not reflect the promotion of the operational solutions before the medium and long-term ones. Therefore, it should not be narrowed down only to measures for securing employment for the unemployed. There is only one such policy, and it is only a reactive component of employment policy for society's unequal economic, social, and environmental development. Equally, educational policy is not only about formal education in detailed skills and

competencies. The pace of social and technological change requires human resources that can efficiently and creatively develop quality general foundations for industry from natural and technical sciences and for management and public administration from humanities and economic sciences. It is about an effective lifelong learning system linked to increasing the rate of adaptability of human resources to changes in the labour market and innovation trends.

According to this study, employment policy for industry must respond to forecast change in a **business model that is different from what has been dominant in the SR so far**. The new business model is based on civilisational changes, the high pace of technological changes, demographic development, and changes in social relations within society. A holistic perception of the whole production system characterises it. This is characterised by a departure from the original business model based on cost reduction, quality optimisation, Taylorism, and low price of labour. **The new business model strategy is based on high-added value, competitive capabilities, innovation and knowledge, and on work using artificial intelligence**. This progressive new business model **can only be ensured by the human resources of the new generation**, which will be competitive on a global scale. An employment policy responding to these needs must be focused on the following:

- to ensure sufficient qualified creative human resources for high innovation, the ability of industrial enterprises in the SR;
- to restructure of the current generation of human resources to a new business model, in which a new conceptual system of corporate continuing education must become a key component of lifelong learning, relieved from the bureaucratic, rigid state system reports in the entire structure of corporate human resources;
- to create appropriate professional and financial conditions at the state level of regional and local governments, universities, institutions of formal education, and civil associations;

The new conceptual system of corporate continuing education is based on the modernisation of services employment. The basis of this transformation is the focus on the needs of the new human resources structure for a modern business model. Such modernised employment services should help corporate structures to increase the competitive ability of employed human resources. At the same time, competencies and skills and the resulting knowledge must be essential and not formalised classification to the original job standards.

Cooperation and networking

Effective cooperation between sectors, institutional actors responsible for active labour market policies and lifelong learning systems, representatives of employers, employees, and local authorities is the right way to achieve consistency between the quality of the lifelong learning system and the labour market needs. Sector councils (24) active in the SR, under the management of social partners, elaborated sectoral strategies for developing human resources, which proposed sectoral measures to ensure human resources align with developments in the labour market and innovations until 2030. It is essential to establish procedures for implementing measures at the national level under the coordination of The Council for Economic and Social Partnership of the SR in cooperation with the Alliance of Sector Councils and individual sector councils. Consensus agreement between departments is necessary to implement and approve the procedure for fulfilling measures of sector strategies at the level of the Government of the SR.

Adaptability to new conditions

The key objective of the future period from the point of view of preparing human resources for the

labour market is an increase in competence levels, **increasing qualifications, recognition of the results of informal education and informal learning, flexible further education of adults in the form of targeted retraining, upskilling and reskilling following innovative trends in the labour market.** The lifelong learning system must be directed towards developing "programmes" of education and, above all, **"educational projects," which contain new tools and methodologies.** These tools and methods **must be capable of transferring technical knowledge leading to the acquisition of digital skills and the development of soft skills.**

In addition to specialised skills in their own field of competence, specialists are required to have a number of key non-cognitive skills that will enable them to face the challenges of the Fourth Industrial Revolution.

If, on the one hand, **the lack of skills can be attributed to a lack of awareness among young people about the potential offered by digital transformation,** it is also true that **companies still invest too little in professional training** (or in upskilling and reskilling).

The main protagonists of change will be teachers/trainers/coaches/supervisors. They need to develop key competencies in pupils, students, and learners that determine the degree of adaptability in the labour market.

The lifelong learning system, but also active labour market policies, needs to adapt to the current world, understand change, and become resilient to change in line with the challenges posed and brought about by technological progress.

Learners will only be able to truly develop their digital and other skills and use technologies effectively if the skills of the teachers/trainers/coaches /learners themselves are fully developed. In fact, learners have to play not only the role of coaches but also facilitators when it comes to using technology for education. In this regard, the skills of educators are essential. Learners must establish a standard basis for digital skills that meet new training needs and align with the tools available while maintaining a balance between traditional and 'technological' teaching methods.

A curriculum that meets the requirements of the labour market

Developing integrated skills such as programming and developing "logical thinking" (enabling keeping up with evolving technologies) is an absolute priority. The development of these skills should be fully integrated into most educational programmes. Data understanding of the labour market in terms of skills (either available or to be supported in the future) is, in fact, fundamental to formulating the content of education. The main objective remains to ensure the employment of individuals in the labour market (and, at the same time, ensure the competitiveness of businesses). It is necessary to change and modernise the content of education cooperation of key strategic departments in this area (labour, education, economy, informatisation), representatives of employers, and experts in specific competence areas, and their usability within work activities.

Let's speak the same language

To harmonise procedures will be essential to use a uniform terminology and classification context compatible at the European and national levels. In particular, it is recommended to use the International Classification of Occupations SK ISCO, Statistical Classification of Economic Activities NACE Rev. 2, European Skills, Competences, Qualifications and Occupations (ESCO) classification, and their equivalents at the national level in terms of classifications.

The proposal of key measures for employment restructuring in the 2030+ horizon



Within the framework of the employment policy of older workers, there is no comprehensive concept of age management in Slovakia.

1. Employed

- a. **Put into practice a new conceptual system of corporate continuing education** based on the modernisation of employment services in order to help companies increase their competitiveness in the ability of employed human resources following innovative labour market trends and attractive to the working population, supporting personal development
- b. **Graduates of the formal education system**
 - i. Comprehensive evaluation of the application of graduates in the labour market with a focus on the performance of work in the graduated field
- c. **The Young**
 - i. The creation of employer-level support for creating a job position “coordinator of further education” aims to create an exact link between the needs of the labour market and the direction of further education at the company and the regional level
 - ii. Creating a relationship to lifelong learning through attractive conditions for regular further education of young people in the labour market through individual educational accounts, or corporate training programmes
- d. **The Elderly**
 - i. Involvement of universities in the process of further education of highly qualified labour market professionals

- ii. The development of an age-management strategy with subsequent implementation of the legal order of the SR
 - iii. Creating conditions in employer organisations for a smooth and dignified transition of older employees to the retirement phase of life, including requirements for passing on professional knowledge to younger employees
 - iv. Updating labour law regulations (especially the Labour Code) following the social need for new forms of work performance of older employees and their flexible retirement (e.g., a combination of pensions and work performance, adjustment of work-from-home conditions for older employees, job place sharing, etc.)
 - v. Elaboration of The National Digital Skills Strategy of the SR with a focus on people in productive and post-productive ages with the proposals of programmes for the improvement of digital literacy and inclusion of all population groups in the digital world
- e. Employees from other countries**
- i. Identifying professions and sectors with domestic labour shortages to facilitate the entry of third-country nationals into the Slovak labour market
 - ii. A comprehensive migration policy, especially with a focus on a highly-qualified labour force (e.g., draft resolution of the Government of the SR in relation to national visas for talents and experts and national visas for in-demand professions in short supply)
 - iii. Activation of support schemes for the return of specialists and experts working abroad and re-evaluation of the conditions for applicants for support without redundancy bureaucratic burden
- f. Updating the Labour Code following the upcoming labour market changes and employment forms**
- g. Ensuring the institutionalisation of the Alliance of Sector Councils and Sector Councils as a tool identification of innovative trends affecting the labour market and appropriate measures to increase the human capital potential**

2. Unemployed

a. Short-term unemployed

- i. Innovating the focus of employment services from addressing unemployment dealing with the support of the competitiveness of the employers and employees by introducing innovative changes, supporting their individual learning and adaptability in the labour market
 - ii. Setting priorities for the education of the unemployed based on prediction and pressing (at the time) the needs of the regional labour market and changes in sectors of the national economy
 - iii. Ongoing evaluation of the quality and success of reskilling and another type of education concerning the employability of the unemployed in practice after completing the education
- b. Long-term unemployed**
- i. Active cooperation of state authorities with local self-government authorities identifying the needs of the regions or the needs of the state that could be secured by the performance of the work of the long-term unemployed and partially covered by state contributions



1. EDUCATIONAL POLICY FOCUSED ON MATCHING THE NEEDS OF THE LABOUR MARKET WITH THE ČŹV SYSTEM

a. Curricular reform of primary education

- i. Prioritising curriculum reform by identifying key competencies and determination of the profile of the graduate at the appropriate qualification level
- ii. Creating partnerships between primary and secondary schools aimed at popularising promising professions, e.g., sharing laboratories, workshops, etc.

b. Secondary vocational education reform

- i. Curricular reform aimed at acquiring key competencies conditioning the increase of adaptability of secondary school graduates in the labour market
- ii. Regular prediction and refinement of the need (at the time) for new knowledge, skills, and competencies with the intent to transfer them to the

content of education at the school level and fields of study to increase the adaptability of secondary school graduates in the labour market

- iii. Optimisation of educational content focused on transferring innovative trends, technological changes, digitisation, robotisation, etc., in the labour market
- iv. Optimisation of the secondary school network aimed at creating excellence centres of vocational training
- v. Continuous continuation of the dual education system with a focus on training practical skills of pupils at the employer
- vi. School performance planning in line with labour market developments and forecasts
- vii. Setting motivational factors or normative preference for providers of technical and natural science education for support alignment of vocational training and the needs of the labour market
- viii. Setting up a strategy to eliminate the outflow of secondary school graduates to continue studying at universities abroad, especially in the field of STEM, which is key in terms of future technological changes
- ix. Creating sector partnerships between secondary schools with universities, employers, and research organisations for the purpose of quality improvement preparation for the labour market and continuous education of teachers (especially, vocational subjects)

c. Tertiary education reform

- i. Setting up a new funding system for universities reflecting the needs of society, and the labour market and encouraging higher education institutions to improve their quality
- ii. Setting the rules of effective management of universities aimed at achieving high-quality results at the level of internal management processes, quality, and applicability of graduates, and external customer satisfaction – the recipient of the output
- iii. Regular prediction and refinement of the need (at the time) for new knowledge, skills, and competencies with the intent to transfer them to the content of higher education to increase the adaptability of university graduates in the labour market
- iv. Alignment of the offer structure of study programmes to the needs of the labour market
- v. Building a partnership of the Alliance of Sector Councils with the Slovak Accreditation Agency for Higher Education in the area of assessment,

- revision, and updating accreditations of study programmes following innovative labour market trends and labour market needs
- vi. Establishing an optimal system of dual education at universities with focusing on supporting the practical skills of future graduates
 - vii. Setting up motivational tools to support university students working alongside their studies in school in the field of school preparation
 - viii. Effective enforcement of proposals to attract experts from abroad to the functional positions of associate professors and professors who will pass on their knowledge to students of Slovak universities
 - ix. Developing and setting up an effective strategy to eliminate the outflow of university graduates abroad to support, especially for the best, their entry into the Slovak labour market or to create motivating conditions for participation in the national and international research and development
 - x. Determination and setting of valid indicators of the quality of tertiary education
 - xi. A clear distinction between the more demanding study programmes designed for talented and motivated students with more advantageous normative funding and a limited number of places
 - xii. Setting the national rules for the selection of qualitatively suitable adepts for university studies
 - xiii. Determining the future needs of the labour market concerning study programmes with motivational or normative favouring of programmes with an acute lack of highly qualified experts
 - xiv. Strengthening the importance and popularity of Bachelor's degree programmes as higher education for the needs of the labour market
 - xv. Increasing the attractiveness of studying at Slovak universities for the best Slovak and foreign students
 - xvi. Creating partnerships between universities and scientific research institutions and employers within the framework of applied research and the setting of incentives factors for the active cooperation of universities with the business sector in research and development
- d. Active society-wide strengthening of the educator's status and increasing the average of gross wages compared to university-educated people in the national economy**
 - e. Adopt talent development as a national priority**
 - f. Integration of ICT into educational processes**
 - g. Overcoming the generation gap between students and teachers**

- h. Shortening processes in the introduction of new professional multidisciplinary programmes for secondary schools and universities responding to global innovation trends**
- i. Creating motivational tools for acquiring young people's entrepreneurial skills and increasing interest in business**
- j. Reform of the Lifelong Learning System**
 - i. Establishing of a clear management model of the lifelong learning system on the national level, as a cross-sectoral priority in the SR
 - ii. Involvement of the Alliance of Sector Councils and Sector Councils in the management of the lifelong learning system based on the principle of an active partnership of the state and the social partners
 - iii. Using the system for predicting the needs of the labour market for a qualified labour force and changes in the level of future skills and competencies of the labour force to determine priorities of the lifelong learning system
 - iv. Regular update of national standards of employment and qualifications standards as a starting point for determining the content and focus of the lifelong learning system and recognition of its outcomes in practice
 - v. Setting the strategy of motivating adults with the identification of effective support tools for entering the lifelong learning system
 - vi. Setting a qualified counselling strategy for the career preparation of those who come to the labour market, those who are in the labour market and have to react to changes in the market, those who inevitably need reskilling, and those who will leave the labour market
 - vii. Unequivocal division of priorities for the implementation of reskilling and further education of employed individuals and further education of unfocused individuals with a focus on regional labour market needs
 - viii. Creating national standards for further education, especially modules for retraining, reskilling, and upskilling
 - ix. Restructuring of labour, social affairs, and family offices into modern centres of regional counselling and lifelong learning
 - x. Creating a system to support business education as a basis for building competitiveness of employers in the SR through proven tools such as individual education accounts, corporate training programs, etc.
 - xi. Allocation of resources for continuing adult learning as significant and socially beneficial, and returnable investment with the determination of combined financing schemes from the EŠIF sources, as well as the state budget
 - xii. Introduction of an efficient and transparent system of lifelong learning results and verification of qualifications for citizens of the SR

- xiii. The introduction of a quality assessment system for further education providers with information available to the general public
- xiv. The use of the Strategy for Lifelong Learning and Counselling approved by the Government of the SR as a basis for starting processes of more active linking of the lifelong learning actors and the labour market



Family and social policy

- a. **Developing a new family policy aimed at more significant support of the birth rate, non-discriminatory support for more even population growth in all sections of society (income, education, national, ethnic, urban, rural, etc.)**
- b. **The creation of social conditions for families within the family policy to support future mothers to have their first work experience before their first birth and subsequently to create suitable employment conditions for parents of minor children, especially children under three years of age**
- c. **Creation of conditions for harmonising work and family life for all population groups, including incomplete families and families with social disadvantages, to exploit the potential of parents in the labour market**
- d. **Developing a network of preschool facilities to meet the needs of parents with young children so parents could actively participate in the labour market**
- e. **Development of the concept of state family policy as an objective basis for setting up an effective state social benefits system for families**
- f. **Implementation of the impacts of innovative and technological changes in proposals for determination parameters of social insurance benefits and pension benefits for employees and the self-employed**



Support of the social dialogue

- a. **Creating optimal conditions for the involvement of professional and social organisations representatives, employers, employees, state administration, and territorial self-government to assess the impact of technological and innovation trends on structural changes in employment, the impact of digitisation, robotisation, and other processes on changes in knowledge, skills, competencies, emergence, change, or the demise of professions**

Annex 1 The OECD and the EU recommendations on the digital economy

The OECD provides rich sources of recommendations and insights on the key importance of the digital economy for national governments as well as for individual departments and organisations such as:

- The field of Digital Economics: <https://www.oecd.org/sti/ieconomy/>
- The trends and analysis of emerging opportunities and challenges in the digital economy, partner approach economies using information and communication technologies (ICTs) and the Internet to meet their public policy objectives, regulatory processes, and policy options for policymakers to help maximise the potential of the digital economy as a driver of innovation and inclusive growth: OECD Digital Economy Outlook 2020 —
<https://www.oecd.org/sti/ieconomy/oecd-digital-economy-outlook-2020-bb167041-en.htm>
- A measurement roadmap for the future: Measuring the Digital Transformation - https://www.oecd-ilibrary.org/science-and-technology/measuring-the-digital-transformation_9789264311992-en
- Trends in the Digital Era: Trends in the Digital Era - https://www.oecd-ilibrary.org/sites/9789264311992-en/1/2/1/index.html?itemId=/content/publication/9789264311992-en&csp_32da5d2095ef596b16d96b0367b9d519&itemIGO=oecd&itemContentType=book

Similarly, the EU provides a rich overview of the importance of the digital economy, including supporting education for 2030:

- Annex to the Communication from the Commission to the European Parliament, the Council, the European Economic
- and Social Committee and the Committee of the Regions: 2030 Digital Compass: the European way for the Digital Decade https://eur-lex.europa.eu/resource.html?uri=cellar:12e835e2-81af-11eb-9ac9-01aa75ed71a1.0017.02/DOC_2&format=PDF
- Europe's Digital Decade: digital targets for 2030- https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_sk

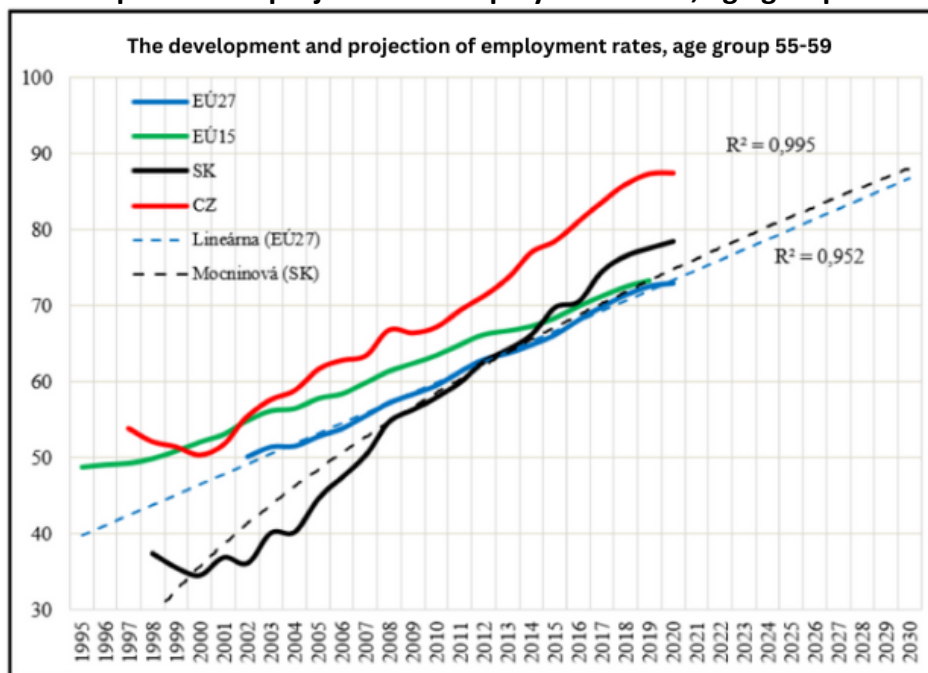
Annex 2 Additional data in relation to demographic development in Slovakia until the year 2030+

Table 13 Employment projection in specific age groups of older workers based on labour force survey data

Age	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
60-64	128844	129741	132442	136630	139472	141432	143338	143783	145175	148155
65-69	32298	35795	37395	40240	42923	45491	47846	50825	54380	57407
70-74	10398	11137	12091	13072	13949	15040	16027	17852	18240	19487
65-74	42696	46932	49486	53312	56873	60531	63874	68677	72620	76894

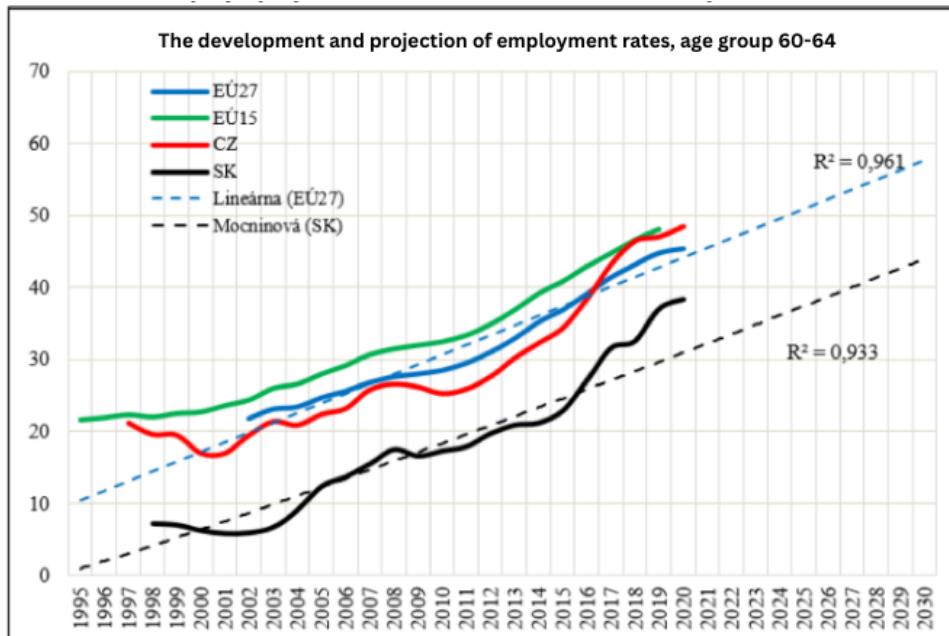
Source: *Calculations of doc. Ing. Vladimír Baláž, PhD., DrSc. based on Eurostat data*

Graph 24 The development and projection of employment rates, age group 55-59



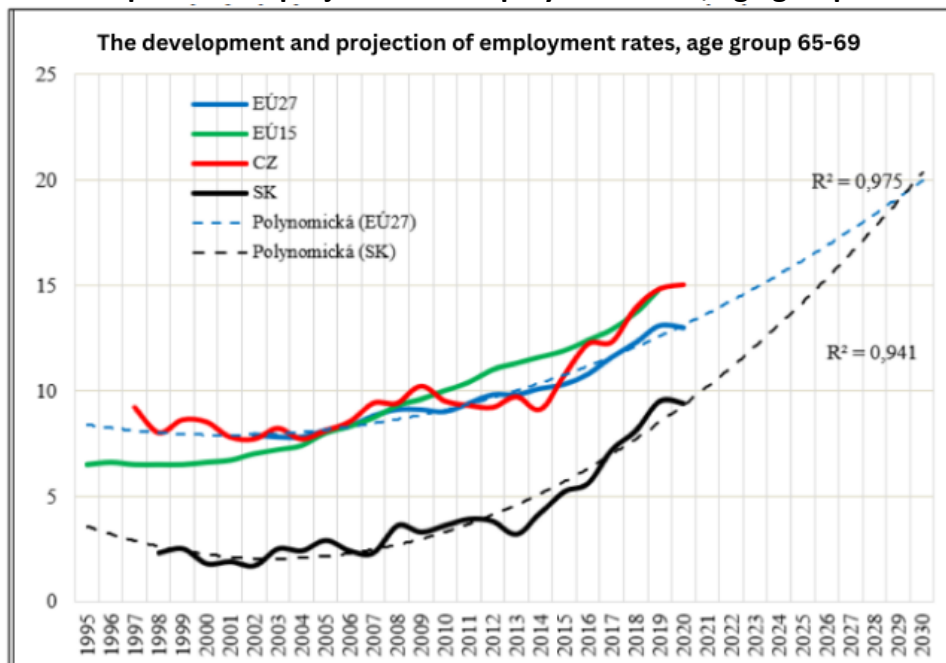
Source: Eurostat (2021): *Employment by sex, age and economic activity* and calculations by doc. Ing. Vladimír Baláž, PhD., DrSc.

Graph 25 The development and projection of employment rates, age group 60-64



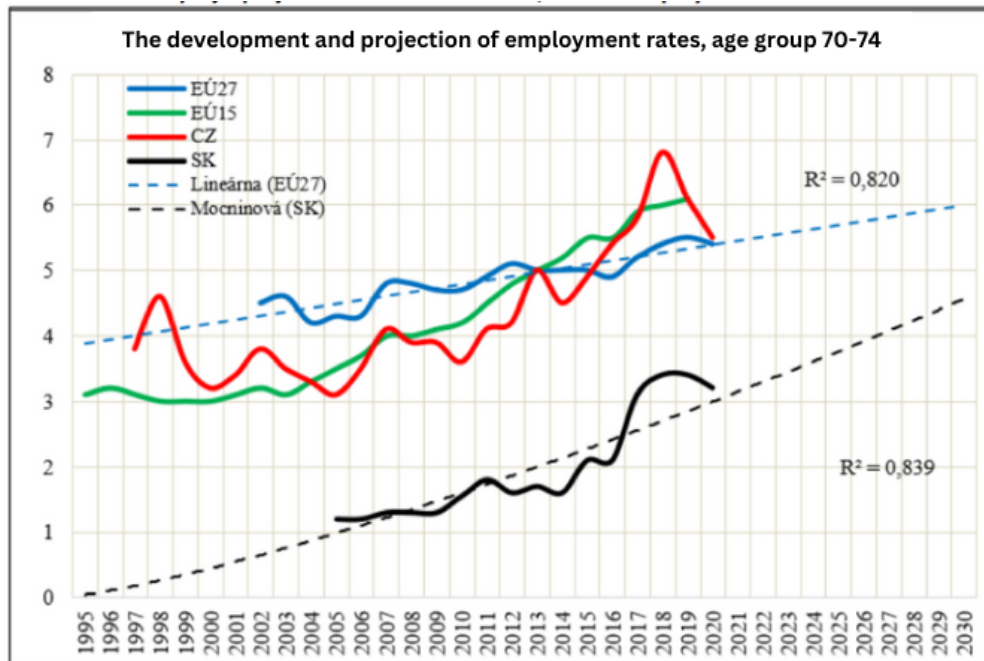
Source: Eurostat (2021): *Employment by sex, age and economic activity and calculations by doc. Ing. Vladimír Baláž, PhD., DrSc.*

Graph 26 The development and projection of employment rates, age group 65-69



Source: Eurostat (2021): *Employment by sex, age and economic activity and calculations by doc. Ing. Vladimír Baláž, PhD., DrSc.*

Graph 27 The development and projection of employment rates, age group 70-74



Source: Eurostat (2021): Employment by sex, age and economic activity and calculations by doc. Ing. Vladimír Baláž, PhD., DrSc.

