DISADVANTAGED EMPLOYEES IN INDUSTRY 4.0

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The article's subject identifies employee groups affected by the implementation of Industry 4.0 in business practice, either positively or negatively. Apart from the identification of the groups in question, it is essential to name where the disadvantage lies from the subjective point of view of the employees but also the objective point of view. The implementation of Industry 4.0 in enterprises brings not only a threat in the form of redundancy of the current workforce but also an opportunity to make the employees' work performance more efficient and improve their working conditions. Several analytical methods were used to obtain comprehensive analytical background. They were used to identify disadvantaged groups of employees, describe the groups of employees and to what extent they are affected by the work activity, and where their disadvantage lies in implementing Industry 4.0. A comprehensive assessment of the identified disadvantaged groups of employees within Industry 4.0 serves to understand the threats to the workforce better and allows for the targeted implementation of policies and practices to work with the current crew in the changing ways of working within Industry 4.0 and thus also contribute to the prevention of work-related diseases and workforce devaluation.

KEYWORDS

employee, generation, occupational disease, Industry 4.0, work conditions, work change

1 INTRODUCTION

The current development of the information society depends on the skills and knowledge of human resources and how their knowledge and skills can be used for a better community. Information and knowledge are gradually gaining ascendancy and have already assumed a prominent position in the social process. Information influences not only the structure of the economy or society but also the whole civilization [Marikova 1996].

Sociologists define a generation as a group of persons who were born and grew up at approximately the same time. Thus, a generation is "a large and internally differentiated group of persons who are linked by a period-conditioned style of thinking and acting, who have lived through a substantial period of their socialization in the same historical and cultural conditions" [Marikova 1996].

It is common knowledge that people today are healthier, live longer, and work longer. It should also be taken into account that many people of the older generation are not yet financially able to retire. Also, some of them are still financially supporting their millennial children living at home from 20-30. Thus, we are currently seeing up to 5 generations in the workplace [CV Library Recruiter 2019]:

- The Silent Generation - born between 1925 and 1945;
- Baby Boomers - born between 1946 and 1964;
- Generation X - born between 1965 and 1980;
- Generation Y (Millennials) - born between 1981 and 1995;
- Generation Z (iGen) - born in 1996 and later.

Although the trend towards age diversity is increasing, age discrimination remains a common problem in the workplace. Globally, 17.3% of employees currently face age discrimination. For the majority of them, 49.4%, the reason is their advanced age. Conversely, 45.3% of people have been judged because of their shortage. Behind these figures is the company's focus on one type of applicant. Some companies are only looking for mature candidates with a lot of experience, while others prefer only young talent that they can nurture according to their company culture [CV Library Recruiter 2019].

Generation X and Generation Y make up the largest group of workers. If employers had a better understanding of how both groups of people work, they would be able to retain them.

Generation X represents the most influential and outstanding entrepreneurs in history. The working man of this generation is educated, technically literate, and self-employed. While these employees have a strong work ethic, they are committed to their families and lifestyles and expect flexibility in the workplace. Generation Xers are creative, productive and independent. They work best when no one is "supervising" them.

Generation Y is nicknamed the "millennial" or "baby-boomer" generation. They are tenacious and confident and enter the workforce with high expectations of themselves and their employer. Generation Y has been 'programmed' to perform better; they are held to a higher standard and are expected to be more knowledgeable. They thrive in a fast-paced work environment and are eager to change the rules from their first day on the job. At work, they expect feedback on any work task or project and have high salary expectations. They also have no problem "bouncing" from one job to another until they find a job that suits them. Generation X and Y are made up of loyal, innovative and creative workers. Employers who adapt to the needs of Generation X and Y will keep them in the workplace much longer while at the same time working for them at an increased rate of [Generation X and Y 2022].

Europe's population is gradually ageing. The proportion of the population aged 55 and over increased from 25% in 1990 to 30% in 2010 and is estimated to peak at around 40% by 2060 [Eurostat, 2012]. The two leading causes of this ageing population are that Europeans are living longer than ever before, on average ten years longer than in 1960, and fewer children are being born [Storie 2012].

As people are now living longer, healthier and working longer, older workers make up an increasing proportion of the workforce. Therefore, managing OSH for an ageing workforce becomes a priority. Since the late 1990s, increasing employment rates and extending people's working lives have been essential objectives of national and European policies. In 2018, the employment rate in the EU-27 for people aged 55 to 64 increased from 40.5% to 58.5% compared to 2005. This is still much lower than the employment rate for people aged 20 to 64, which reached 72.6% in 2018. The Europe 2020 employment target of raising the employment rate for the 20-64 age group to 75% means that people in Europe need to work longer [EU-OSHA 2021a].

Suppose we want to ensure that older workers can perform to their full potential. In that case, it is essential to care for the workforce and ensure that it is not devalued by exposure to adverse risk factors in the workplace, resulting in the development of occupational diseases EU-OSHA, 2021a. The aim is to improve the lives of individual workers and minimise

the costs of work-related illness and death. Work-related diseases include [EU-OSHA 2021b]:

- Musculoskeletal disorders;
- Stress and mental health disorders;
- Work-related cancers;
- Skin diseases;
- Work-related diseases caused by biological agents.

Although the underlying causes of these diseases may be complex, specific workplace exposures contribute to the development or progression of the disease. The risks associated with these exposures and their combinations and changing ways of working need to be closely monitored [EU-OSHA 2021b].

As a result of the natural ageing process, some functional abilities, primarily physical and sensory abilities, are lost. These possible changes in functional abilities need to be considered in the risk assessment, and the work and working environment need to be adapted to take them into account. Age-related changes in functional ability are not uniform due to individual differences in lifestyle, diet, physical fitness, genetic predisposition to disease, level of education, work and other factors. Their previous lifestyle conditions the health of people in later life. The functional decline can be slowed and mitigated by healthy lifestyles such as regular exercise and a healthy diet [EU-OSHA 2021a].

There are many stereotypes about older employees. For example, older workers are often expected to be less motivated and productive than younger workers [Warr 2001]. However, the reality is quite different and much more complex. Some abilities increase with age, and other new skills emerge, such as discernment, strategic thinking, holistic perception, and reasoning. In the same way, work experience and expertise grow with age. There are significant inter-individual differences due to genetic factors, lifestyle and work-related influences. In other words, age alone does not determine health and work performance. However, the ageing process involves changes in physical, mental and motor abilities that can affect performance [Panda 2016, Ybema 2022].

As we age, physical abilities decline and cognitive function changes. An example of physical deterioration due to ageing is the loss of muscle strength and lung capacity. They are most relevant to strenuous physical work. From 50 onwards, employees also need more time to recover from work [Zwart 1997]. Poor health indicators and health problems increase with age, such as back pain and sleep problems. However, after 60, there is a decreasing trend in health problems among working people. This is probably due to the 'healthy worker effect' [McMichael 1975], i.e. individuals in poor health leave the labour market at a younger age than those in good health [Eurofound 2012].

Older workers are not a homogeneous group; there can be significant differences between individuals in the same age group [EU-OSHA 2021a].

The workplace plays a crucial role in promoting healthy lifestyles and activities that prevent physical decline, thus contributing to the maintenance of work capacity. Well-designed workplaces benefit all age groups, including older workers. As working ability changes, so must work, which can be compensated for, for example [EU-OSHA 2021a]:

- by changing job design or job rotation;
- more frequent short breaks;
- better organisation of shift work, e.g. quick rotating shifts (2-3 days);
- good lighting and noise control;
- good ergonomic design of equipment.

Introducing aspects of Industry 4.0 into companies, taking into account the needs of older generations of employees, can be a way to help improve the working conditions of employees, and also to keep older employees employed.

Industry 4.0, or the fourth industrial revolution, was introduced in 2011 at the Hannover Fair in Germany to keep Germany at a high technological level. Subsequently, the idea was spread to the surrounding countries [Ghobakhloo 2018]. Industry 4.0 is built on people, machines, equipment, logistics systems and products being able to communicate and collaborate directly. Everything is moving towards total networking. The reason for this is the use of vast amounts of previously uncapturable information to make significantly faster and more correct decisions. Tight integration of products, equipment, and people increases the efficiency of production machines and equipment, reduces costs and saves resources. Intelligent tracking and transparent processes provide companies with continuous visibility that enables them to react quickly and flexibly to market changes. Businesses are moving towards the so-called Smart Factory. The Smart Factory operates in a Smart Environment (Smart Grids, Smart Mobility, Smart Logistics, Smart Buildings...) As Industry 4.0 becomes more embedded in every industry, it will ultimately lead to a traction economy built on real-time demand intelligence, highly automated and flexible manufacturing, and fully connected. Developments in this direction foresee the ubiquitous use of automation, robotics and intelligent machines to complement human labour. As a result, the nature of workforce engagement will change dramatically, along with new forms of skills the workforce will need to succeed in a much more automated economy [Industry 4.0 2022].

The current emerging dynamic changes in the labour market in relation to Industry 4.0 will require the reshaping of existing jobs, the creation of new positions with a significant demand for new skills [Krenicky 2018].

2 METHODOLOGY

The paper is based on the results of the statistical survey of the Ministry of Health of the Slovak Republic, the collection and processing of which is carried out by the National Centre of Health Information; the Statistical Office of the Slovak Republic, the Ministry of Labour, Social Affairs and Family of the Slovak Republic; the Institute of Labour and Family, the statistics of the Office of Labour, Social Affairs and Family of the Slovak Republic. In the preparation of the article, we further use the material collected within the framework of quantitative and qualitative research in industrial enterprises in Slovakia. The data were collected through an online questionnaire within the data collection of the project "Identification of priorities for sustainable human resource management about disadvantaged employees in the context of Industry 4.0". The collected data were statistically processed. An essential source for the evaluation of the outputs was also the results of research by foreign authors.

3 RESULTS

A large amount of analysis has been carried out to estimate the impact of Industry 4.0 on the economies of individual countries. Suppose we would like to predict the impact of Industry 4.0 on the economy of the Slovak Republic. In that case, we can start with the effect on the German economy, which will be manifested in Slovakia with a specific time lag. It can be expected that the impact on the gross domestic product (GDP) will be more minor in the early stages of the introduction of digitalisation and will only reach its peak between 2025 and 2030. Nevertheless, consumption and exports within the

economy are expected to increase for greater competitiveness, mainly due to lower production costs, which in turn will be reflected in labour relocation processes towards sectors with a higher need for skilled labour. The latter will also have higher salaries. Considering the above factors' development, the following shift in terms of the employment structure can be expected in the context of the next 10 to 15 years. A decline in the number of jobs is expected, particularly in manufacturing occupations, while a more robust growth is anticipated in service-oriented professions. There should also be a positive effect in construction occupations, where the impact of initial investment should persist. In this area, no significant impetus towards efficiency or productivity gains is expected, and hence, lower interest in the labour force. The most crucial job losses will be increased efficiency and lower spoilage of new technologies.

On the other hand, the most significant job growth is expected in IT and scientific positions, legal and business consulting, and media and arts occupations. The IT sector is expected to benefit most from investment in equipment and the digitisation of the agricultural and manufacturing sectors. Last but not least, the education sector will also benefit from future developments thanks to the rising costs of lifelong learning for businesses. [RUZ 2017].

It is clear from the projections that there will be changes in the need and structure of the labour force that will be in demand in the labour market (Figure 1). A time horizon of 10 to 15 years, when the implementation of Industry 4.0 will take effect, shows that these changes will need to be managed with a large percentage of the workforce already in the labour market. It is these employees who may be disadvantaged for various reasons when Industry 4.0 is put into practice.

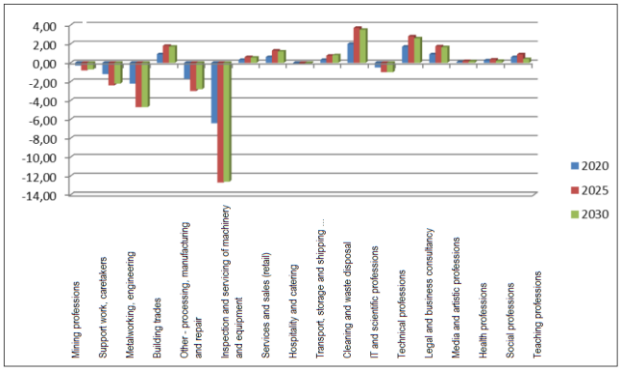

Figure 1. Percentage impact on the introduction of Industry 4.0 per economic sector [RUZ 2017]

Regarding the impact of Industry 4.0 on the skills structure of the workforce, i.e. educational attainment, it is estimated that around 165,000 jobs will be lost in Germany by 2030 for people with no vocational education or training. On the other hand, jobs will be created mainly for graduates of technical universities and faculties, roughly 120 000 jobs. These figures represent the model impact of the introduction of Industry 4.0 in Germany [RUZ 2017].

To illustrate the estimated impact of the introduction of Industry 4.0 in Slovakia, it is necessary to compare these movements in the expected employment structure with the current system of the economy in Slovakia. From a long-term perspective, it can be seen that the employment structure in Slovakia has not changed significantly in recent years, so the latest available figures from the 2016 [RUZ 2017] are used. The development of employment in Slovakia is modelled in the Figure 2.

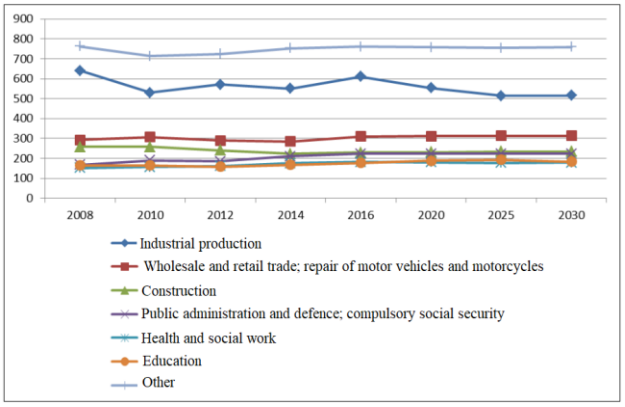

Figure 2. Expected development of employment in the Slovak Republic by main economic sectors (in thousands) [RUZ 2017]

The chart shows that the introduction of Industry 4.0 in the context of the next fifteen years will be dominant in Slovakia, especially in the Industrial Production sector, where a decline of over 95 thousand jobs is expected by 2030. The central part of these losses is likely to come by 2025. On the other hand, some sectors are expected to strengthen relatively over this period. By 2030, the number of opportunities in the education sector is expected to increase by at least 7 thousand jobs. The second area where job growth is expected to be more significant is IT and communications, where 2,400 new positions are expected. Slovakia must therefore prepare for the need for changes in terms of the educational structure and new qualifications that will be able to gain employment in the Slovak economy by 2030. It will be necessary to focus on developing skills in education and information technology. This implies the need to support and reform the education system and to ensure a quality physical and communication infrastructure [RUZ 2017].

This assumption was confirmed by the TREXIMA survey, in which up to 42% of companies confirmed that digital skills will be a crucial employee capability for the future period and that strengthening employees' knowledge and skills in using the possibilities of digitalisation of the company will be a priority. More than 30% of enterprises perceive a need to improve employees' understanding of workplace applications, processes and technologies [Trexima 2021].

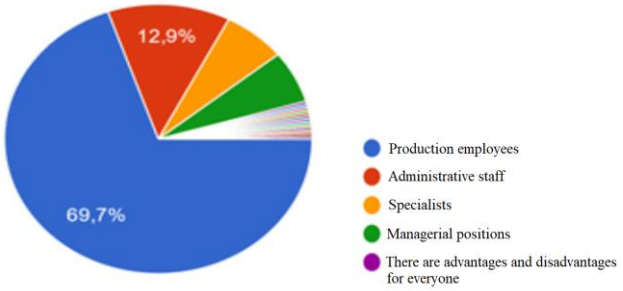

Figure 3. Category of employees perceived by specialists as the most negatively affected by Industry 4.0

The purpose of the project research "Identification of priorities for sustainable human resource management about disadvantaged employees in the context of Industry 4.0" is to investigate the potential of disadvantaged groups of employees in the context of changing conditions of industrial enterprises about the uniqueness of different generations of employees. During the pre-research, which was targeted at the experience of specialists from industrial practice, the project investigated not only the extent of implementation of Industry 4.0 and its impact on enterprises but also the impact of Industry 4.0 on employees. As a result, groups of employees were identified in

terms of their job classification (Figure 3) and age group who may be potentially at risk from implementing Industry 4.0 in business practice.

In a more detailed analysis of the reasons for the disadvantage of employees by implementing Industry 4.0 in company practice, the interviewed practitioners identified the main reasons that are likely to play a role in the detriment of employees operating in the labour market (Figure 4). The results of the survey thus confirm the results of the forecasts, and the increase in the disadvantage of employees follows the change in the way of doing work brought about by the implementation of Industry 4.0 in practice.

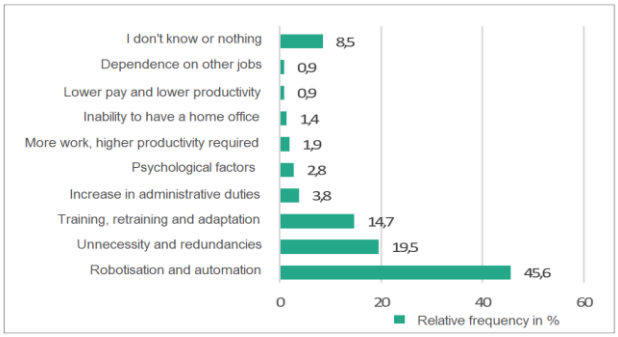

Figure 4. The most serious reasons for employee disadvantage

A closer examination of the reasons for staff disadvantage identified the main factors affecting staff disadvantage. It turns out that the workforce is currently not prepared for the implementation of Industry 4.0 (Figure 5.), mainly due to the lack of professions and competencies of employees that are necessary for the functioning of enterprises implementing Industry 4.0. Generational division of the workforce has also been identified as a significant reason for the disadvantage of employees. It is a problem of the burden of employees due to belonging to a particular generation that we have focused on in this paper.

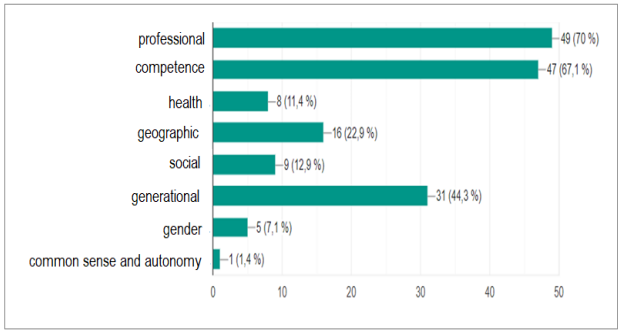

Figure 5. The most serious disadvantages of employees due to the implementation of Industry 4.0

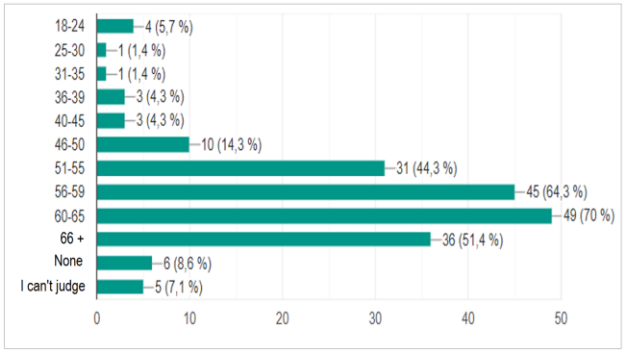

Figure 6. Age distribution of employees disadvantaged by Industry 4.0

The results of the research conducted show that the disadvantage of employees due to the introduction of Industry 4.0 will be most pronounced in the older age categories of employees as illustrated in Figure 6. The disadvantage primarily concerns production and service employees in manufacturing and logistics (Figure 7), which naturally results from the changes in production and the higher degree of the introduction of automation and robotics in industrial production, which was the survey's focus. Another argument why Industry 4.0 will have an impact on the distribution of the workforce is that more than 30 per cent of the working-age population in the Slovak Republic works in an industry.

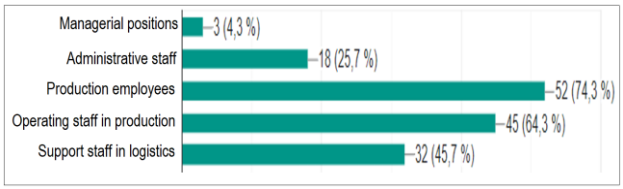

Figure 7. Employees in industry perceived as most disadvantaged in the context of Industry 4.0

It is important to note that employees from the age group that appears to be most disadvantaged by the introduction of Industry 4.0 have been in the workforce for a more extended period. Assuming that they started working when they reached adulthood, many have 40 or more years of work experience. However, in practice, they are also affected by negative cumulative pathogenic factors operating in the work process. At older ages, their impact is also manifested in the form of an increase in occupational diseases. In the next part of the paper, we will look at the quality of the workforce in terms of its health status.

As part of the data collection on the health status of the Slovak population, the development of occupational diseases among employees of Slovak enterprises is also monitored. It should be noted, however, that these are newly recognised occupational diseases, i.e. those that have been identified in a given year, but it is not known whether infections recognised in previous years are persistent or cured. Nevertheless, it can be observed that it is in the 50-59 age group that the highest year-on-year incidence of occupational diseases among employees is (see Table 1).

Table 1. Number of occupational diseases in absolute numbers [NCZI 2022a]

Years	Occupational diseases							
	Total	Gender		Age group				
		men	women	20-29	30-39	40-49	40-59	60+
2020	254	136	118	5	22	80	120	27
2019	347	188	159	7	22	103	130	35
2018	308	187	121	8	16	98	144	42
2017	354	207	147	6	22	109	173	44
2016	316	180	136	18	27	106	140	25
2015	328	215	115	12	29	111	138	38

Source: occupational disease or occupational disease risk report Z (MZ SR) 12-12, NCZI

Data from the Statistical Office of the Slovak Republic show that in 2020 there were 2 531 300 persons registered as working. Based on the monitoring of newly detected cases of occupational diseases, there is a clear year-on-year decline in the incidence of occupational diseases, and they affect men to a greater extent than women. The results show that workers aged between 50 and 54 were the most frequently affected by occupational diseases during the period under review, followed by the 45-49 age group and the 55-59 age group.

In reviewing the reasons for reporting an occupational disease, a list of the most common occupational diseases was drawn up [NCZI 2022a]:

1. limb disease from prolonged, excessive and unilateral loading (52.4% of all reported occupational diseases in the Slovak Republic) ;
2. infectious, communicable and parasitic diseases (11.4%) ;
3. vibration-related diseases (9,4 %).

The year 2021 is described separately, as there is a significant increase in the number of occupational diseases that need to be defined. In 2021, based on the results of the labour force sample survey processed by the Statistical Office of the Slovak Republic, 2 560 600 persons were registered as working in the territory of the Slovak Republic. In 2021, 423 newly diagnosed occupational diseases were reported by healthcare providers (Figure 8.), i.e. 169 more new cases of occupational illnesses compared to 2020, which caused a 66.5% year-on-year increase. In 2021, the rate of new cases of occupational diseases was 16.5 cases per 100,000 workers. Compared to 2020, when 10 cases per 100,000 workers were registered, the incidence of occupational diseases increased by 64.6%. Women were more likely to suffer from occupational diseases than men in 2021 (267 cases; 63.1% of the total) (156; 36.9%). Overall, women experienced a year-on-year increase of 118 new points of occupational diseases, resulting in an increase of 126.3% compared to 2020 [NCZI 2022b].

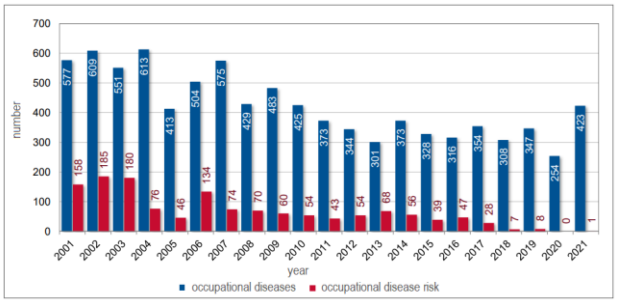

Figure 8. Trends in the number of occupational diseases at risk of occupational disease from 2001 to 2021 [NCZI 2022b]

In terms of the specific type of occupational disease, the most commonly reported in 2021 were:

1. disease from prolonged, excessive and unilateral loading of the limbs - disease affecting the bones, joints, tendons and nerves of the limbs (175 cases);
2. infectious diseases, parasitic diseases or diseases transmissible from animals to humans (162 new occupational diseases);
3. vibration sickness - a disease of the bones, joints, muscles, blood vessels and nerves of the limbs caused by vibration (32);
4. hearing impairment due to noise exceeding normal or permissible levels (17).

In 2021, there was a change and the highest incidence of occupational diseases in the year under review by economic activity classification was in the health sector, with 163 new cases (38.5% of all reported occupational diseases) (Figure 9). Compared to 2020, when 23 new cases of CVD were reported in the health sector, the number of new topics in 2021 increased by 140. Other unspecified manufacturing (38 points), manufacture of metal structures other than machinery and equipment (37), manufacture of motor vehicles, trailers, semi-trailers (37) or also other mining and quarrying (20) [NCZI 2022b].

The rise in the incidence of diseases in the health sector can be explained. In 2021, the COVID-19 pandemic was responsible for occupational diseases in the health sector.

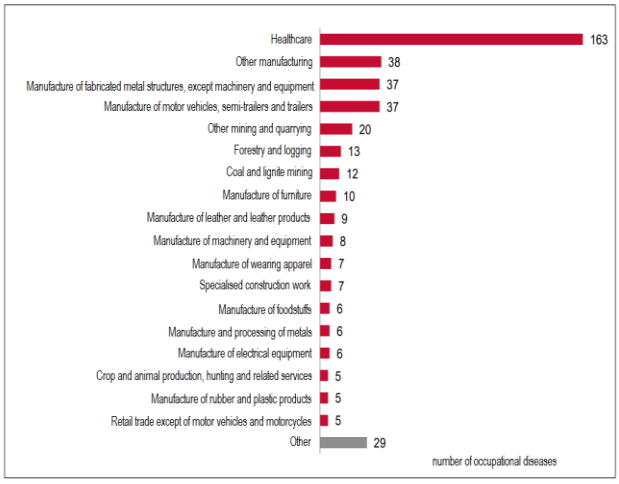

Figure 9. Economic activities with the largest number of newly recognised occupational diseases, 2021 [NCZI 2022b]

An occupational disease was recognized as an illness resulting from COVID-19 infection. The gender distribution of occupational diseases also changed, as the increase in occupational diseases in the health sector was 139 women and 20 men because there is a higher representation of women in the health professions. Notwithstanding the recognition of COVID-19 as an occupational disease, within the 5-year observation period (2017-2021), the highest number of occupational diseases were reported annually for persons aged 50-54 and 55-59 years. Occupational diseases were also recorded frequently among 45 to 49-year-olds (Figure 10).

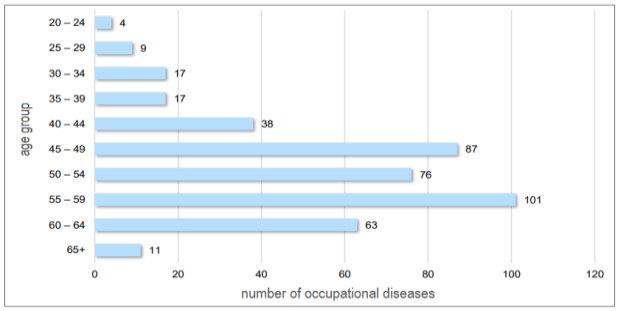

Figure 10. Number of newly diagnosed occupational diseases by age group in the health sector, 2021 [NCZI 2022b]

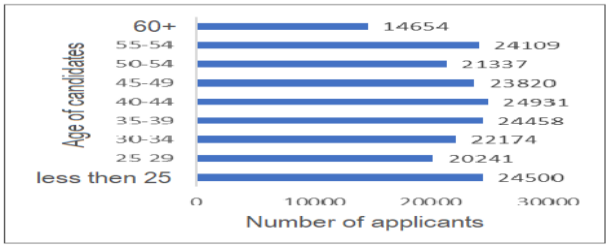

Figure 11. Structure of jobseekers by age as of 31.12.2021

In addition to the workforce in the older age categories (50-55; 55-60; 60+) being affected by prolonged exposure to unsuitable workplace risk factors, it is possible to identify a significant group of people in these age categories who are currently unemployed (Figure 11). This group represents 60 100 people looking for work. If they were to be joined by employees who were unable to work due to occupational illness or who lost their jobs due to the introduction of Industry 4.0, this would create a massive group of people who would have to be taken care of by the state, which would place a considerable burden on the state budget and the social and health system of the state. And this is a strong argument indicating the need to prevent the problem from developing.

Figure 11 presents the total number of unemployed residents of the Slovak Republic. However, the Office of Labour, Social Affairs and Family of the Slovak Republic makes detailed statistics on the reasons for the population's unemployment.
Figure 12 illustrates the individual reasons, where unemployment due to age is represented by the letter b), that is, out of the total number (60,100) of job seekers in higher age categories, age is the reason for their unemployment.

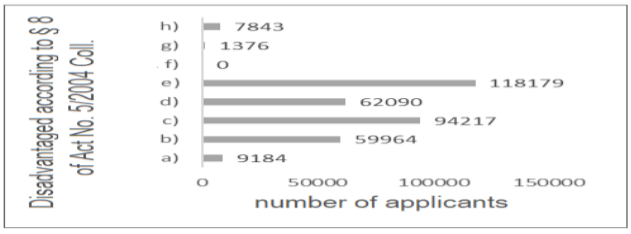

Figure 12. Structure of disadvantaged job seekers in the Slovak Republic as of 31.12.2021

4 DISCUSSION

As is evident from the forecasts, the results of research within the VEGA project and finally, from the statistical monitoring of government institutions in the Slovak Republic, changes are taking place in the labour market in connection with the implementation of Industry 4.0. The nature of work activities is gradually changing with several positive and negative impacts on the workforce. The evolving market situation brings with it the need for qualified employees with technical and general experience, in addition to employees with digital expertise, problem-solving competencies and competence in knowledge management. There will also be a need for employees who can produce flexibly in smart factories that link different work stages and processes through digitisation and networked integration systems and tools, which is what Industry 4.0 is based on [Dyadyura 2021]. With new technologies, new working environments, changing organisational structures, as well as recent collaborations, both external and internal, Industry 4.0 is having a significant impact and influence on vocational training at all levels of education [NUV 2016].
The research results within the VEGA project pointed to the objective and subjective factors of the disadvantages of selected groups of employees. If we base on the distribution of the workforce in terms of generations, the disadvantages of employees as a result of the introduction of Industry 4.0 are primarily related to Generation X. Given that we know the characteristics of the generations, we can use this knowledge to develop targeted measures to promote the retention of employees from the older age groups.
An ageing population poses a serious challenge to society. For example, it puts strains on pension and social security systems, increases healthcare spending and living conditions for older people, and requires adapting the workplace to an ageing workforce [Eurostat 2012].
Research on the quality of the current workforce suggests that the negative impact of cumulative-pathogenic factors of work and the working environment can already be observed in the older age groups that appear to be disadvantaged in Industry 4.0. The removal of the need for strenuous physical work, the introduction of a higher degree of automation and mechanisation of tasks, and the use of self-propelled equipment brought about by Industry 4.0 have its justification in this respect. The automation of tasks by robots can replace employees in hazardous situations, and cobots (collaborative robots) can facilitate access to work for older or disabled employees. The risks are related to the loss of employee control over work, dehumanisation and discrimination, and the consequences regarding lack of transparency and asymmetry of power. Opportunities include:

- Monitoring risks.
- Personalising jobs and working practices.
- Designing healthy and safe employment and workplaces [EU-OSHA, 2022].

Several studies have shown that employability and willingness to change decrease with age is a problem [Lange 2006]. Similarly, research shows that older employees are less interested in learning and development opportunities than younger employees [Kooij 2008, Warr 2008]. In surveys, older workers have often reported that their work does not involve learning new skills [Eurofound 2012], and they also receive less formal training than younger workers [Storie 2012]. This suggests that employers also tend to invest less in their older than younger employees. A consequence of this decline in development may be the obsolescence of an employee's skills, especially in the rapidly changing world of work. This can result in an overall loss of performance and productivity for older employees [Ilmarinen 2001].
Very few interventions specifically address older workers' health and work ability [McDermott 2010, Schalk 2010]. In the future, interventions tailored to the strategies used by different age groups will be needed. Ilmarinen [Ilmarinen, 2001] stresses the need to promote workability, which influences the employment rate of ageing workers, and emphasises that although workability is the same for all age groups, interventions must be tailored to individual age groups. Examples of age-specific measures that can improve the working ability of older workers include training supervisors in age management, the introduction of age ergonomics, workplace exercise programmes and tailored training in new technologies. Researchers suggest additional training and education improve employability and counteract skills obsolescence [Storie 2012]. A University of Warwick study suggests that continuing education strategies are best embedded in a broader age management approach [University of Warwick 2006]. The aim should be to keep the older worker connected to the organisation through work-related learning and work-based learning [Ybema 2022].
In order to meet the demands of Industry 4.0, either from the industries that create new technologies or from those that use them, the whole education system will need to be improved. Improving education at all levels will be a key success factor, so that information about Industry 4.0 reaches the whole population [Marik 2016].

5 CONCLUSION

An ageing population, ongoing technological change, and the need to minimise costs and losses due to occupational injuries and diseases will all need to be addressed. Reducing the physical demands of work activity can be achieved by implementing Industry 4.0, where the use of automation, robotics and intelligent machines to complement human labour is envisaged. However, the implication of this is a dramatic change in the workforce's engagement, along with new skills required to succeed in a much more automated economy with lower physical workloads. It is, therefore, necessary to pay increased attention to finding new forms of training for age-disadvantaged employees or to retrain that specific group of employees to mitigate the impact of the introduction of Industry 4.0 in industrial enterprises. A key success factor will therefore be to improve education at all levels, so that information on Industry 4.0 reaches the entire population.

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