

# **Sociálno-ekonomická revue**

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**Obsah**

**Contents**

**DIGITAL CHALLENGES OF INDUSTRY 4.0 IN ENERGY SECTOR .....5**

*Alena BAŠOVÁ*

**GOVERNMENT ACTIVISM DURING A PANDEMIC.....15**

*Martina JAKUBČÍNOVÁ*

**EVALUATING OF ECONOMIC VIABILITY OF LOGISTICS  
COMPANIES .....24**

*Deimantė KARPAVIČIENĖ, Valentinas NAVICKAS*

**PROTECTION OF NATURAL CAPITAL IN SLOVAKIA .....34**

*Peter NOVÁČEK*

**THE IMPORTANCE OF EDUCATION AND THE THREAT OF  
UNEMPLOYMENT IN THE CONDITIONS OF THE DIGITAL  
ECONOMY .....43**

*Veronika ŽÁRSKÁ*

## DIGITAL CHALLENGES OF INDUSTRY 4.0 IN ENERGY SECTOR

Alena BAŠOVÁ

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### Abstract

*The aim of the paper is to point out the advantages and possible problems in the introduction of Industry 4.0. Its implementation will be associated with the implementation of digitization, Internet of Things, Big Data as well as new marketing strategies, B2B or B2C. It creates a new approach to customers (Prosumer, Agregator), which are new economic categories due to the introduction of industry 4.0. We have used research methods from data collection from foreign and domestic sources, their sorting and paired methods of analysis and synthesis, induction and deduction. We simply illustrated the obtained and processed data in pictures.*

### Key words:

*digitalization, market strategy B2B, B2C, new energy model, Industry 4.0.*

**JEL Classification:** L10, L19, O31, O32

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### Introduction

Technology plays an important role in many areas of our lives, it has made it possible for information access to be faster and faster, producing a transformation in the way we consume and relate with data. Business environment is getting more involved in this constant technological evolution. The industrial sector has been incorporating gradually greater uses of automation and connectivity. The concept of Industry 4.0 refers to some aspects that you have surely heard: fourth industrial revolution, smart industry, interconnected industry or cyber industry. All these definitions refer to the use of technologies to make the manufacturing process more agile, flexible and noticeable to customers. But surely you are interested in knowing what a fourth industry revolution entails, what its benefits are and how you can implement it in your business.

### Literature overview

The concept of industry 4.0 refers to the so-called fourth industrial revolution. This involves the digital transformation of the industry with the integration and digitalization of all the industrial processes that make up the value chain, characterized by its adaptability, flexibility and efficiency that allows to cover customer's needs in the current market. Industry 4.0 represents a qualitative leap in the organization and control of

the whole value chain throughout the life-cycle of the production till to delivery of the product. These changes are applicable for almost all branches of industry. This paper is a free sequel of our article concerning Smart Grids, which are one of the forms already existing practical application of Industry 4.0..

Industry 4.0 is based on the following principles:

Interoperability express ability in communication of all the elements from the providers of goods and services, using cyber - digitalisation systems, robots, Information and Communication Technologies (hereinafter IKT), smart products with their orientation on the people as customers, towns, regions, countries.

Decentralization means, that the capacity creates as the new design of autonomous sub-processes within IKT, elements with the capacity to make decisions autonomously.

Real-time analytics is the ability to collect and analyse large amounts of data (Big Data) that allow the monitoring, controlling and ensure optimisation of processes. New important feature is finding all the results and adopt decisions derived from the process immediately and at every moment.

Virtualization is part of process, which has the ability to generate a virtual copy and the

modelling industrial processes (physical), obtaining virtual models and simulation models and using 3D printer create real "goods". For example, in the automotive industry, the development of new car is realized through the so-called crowdsourcing - you only pay for the result. This 3D printers do this using rapid prototyping to minimize the time to market enter of a new type of car.

Service orientation: the ability to transfer the new value generated to the customer in the form of new services or improved services with

the exploitation of new business models. This marketing strategy is shortly call B2C -business to customer.

Modularity and Scalability: the flexibility and elasticity to adapt to the needs of industry and business at all times, with the ability of these systems are in accordance with market demand.

Next table shows existing changes between traditional industry and its organization of work and Industry 4.0 and the new, possible improvements in its organization of work.

Table 1: Comparison of traditional industry with industry 4.0

| Traditional industry  | Industry 4.0  |
|---|---|
| Mass production   | Production according to customer requirements                           |
| Large factories oriented on big volumes of specific products and services | Smart design of factories with flexible production and competitive cost |
| Planning production based on standard demand                              | Dynamic production in accordance to customers demand                    |
| Physical buying goods and their storage                                   | Product is used as service  |
| Minimization costs  | Maximalization of ratio: profit/used capital                            |
| Monotonous work   | Flexibility in work organization  |

Source: own processing according website: <https://www.what-is-industry-4-0-and-what-does-it-contribute/>

### Competition and drivers of innovation

Competition can be defined as the process in which the market forces operate freely to ensure that society's limited resources are used them as the most possible efficiently as possible to maximize the overall economic welfare. (KOLASKY, W. J. 2004) Competition is often adopted as rivalry between market participants. Famous economist M. Porter considers it not only between competitors on market, but also states it between companies and its customers, its suppliers, substitute products and potential entrants. (PORTER, M. E. 1998) The competition leads to achieving higher profits than other market rivalries, competitors in long time. Significant benefit is the definition of competition within the energy sector, which has a predominantly oligopolistic structure and is appropriate to perceive competition as an

environment of intense changes, in which new, aggressive and innovative competitors move quickly in the markets and take advantages of large companies and established big players yet operate in the energy market not only in Slovakia but also in the EU.

The intensity and type of competition in the sectors has changed from stable oligopolies to intense and rapid competitive rivals use fast, unexpected and unconventional means of competition.( Magretta, J.2012) On the one hand, these positive changes caused the entry of new entities into the energy market thanks to the implementation of the 3rd liberalization package adopted in 2009 A positive change in the entry of new entrants into the energy market has ensured supplier choice and a decline of value of HHI index, which in practice this means reduction a degree of concentration in the energy sector and strengthened the rights of all consumers, mainly

households and small businesses, which are perceived as vulnerable customers. On the other hand, we meet various unfair and illegal practices of suppliers in this market, which often have to solve addressed by the Office for Regulation of Network Industries, which is the regulator in the Slovak energy market. Its role is to regulate the final prices of particularly vulnerable customers, which are still regulated. In addition, it "replaces" imperfect competition in this market.

Several researchers have found that new knowledge, views and innovate ideas rise more from outside of company and bring more innovations than from within companies. (Hillebrand and Biemans, 2004) The transfer of knowledge between companies, or companies and external deliveries, s cooperating subjects have the form of stream transfer, such as the transfer of knowledge between businesses and their customers (market strategy B2C). Another transfer refers to the transfer of knowledge

between businesses and suppliers, universities, or other research organizations (market strategy B2B), which have an end-user who knows the value of a new, innovative product or service. The transfer of knowledge between an organization and outside agencies is a horizontal transfer—the transfer of knowledge between a business and its competitors for the purpose of new product development or innovative development, which ultimately leads to improved business performance and competitive advantage. Distanont (2018) discovered that outside factors that influence the innovation of SMEs can be classified into two groups: factors at the micro level, which are market-oriented (customers, suppliers, and the industry), and outside factors at the macro level, which can have an international context.( Geissbauer, R., Vedsø, J. a Schrauf, S. (2016) This study can we adopt, too for large companies, for big players in energy sector, and a another, specific feature for oligopoly structure of market is creating economies of scale and scope, too.

Table 2: Innovations according Valenta

|                         | Degree | Name                   | Characteristic of innovation                       |
|-------------------------|--------|------------------------|--|
|                         | -1     | Degeneration           | Negative change                                    |
| New variant             | 0      | Regeneration           | Simple change of company                           |
|                         | 1      | Change of quantity     | Increasing(decreasing) of items of company         |
|                         | 2      | Intensity              | Increasing of intensity of company items           |
| Incremental innovations | 3      | Reorganisation         | Positive changes of time and enviroment in company |
|                         | 4      | Qualitative adaptation | Adaptation items of company                        |
|                         | 5      | Qualititation change   | *Qualitative changes items of company              |
|                         | 6      | New generation         | Change of quality of company at all                |
| Radical innovations     | 7      | New kind               | Change of concept of company                       |
|                         | 8      | New principles         | Changes of principles of company                   |
|                         | 9      | New approach           | Change approach to nature environment              |

Source: own processing according Bartes, F.: (2008) *Inovace v podniku*. Brno : Akademické nakladatelství CERM, s.r.o., 2008. [ISBN](#) 978-80-214-3634-3.

It is important for energy companies to know how customers use a product or service - supply of energy commodities (gas, electricity, heat, water) because it allows them to segment their customers into groups, into tariff groups according to the size of their consumption. Subsequently then they adjust the required product, service to customer requirements and set prices commensurate with the quantity of commodity provided or the quality of service provided. Smart and interconnected networks enable companies to develop closer relationships with customers. (PORTER, M. E. (2008) By using ICT, companies can also be informed about the volume of consumption in a short time and subsequently also customers about the price for the provided product or service. As mentioned above, after 2009, customers were able to choose their supplier of energy "products" - switching, which also made a positive contribution to lower prices in the European energy market. (European Commission (2017a)) As we mentioned in the Smart Grid article, smart products can increase customers' market power by reducing their dependence from producers, suppliers, distributors.

1. A smart product will require new design principles. It is not a matter of hardware design, but mainly of software that needs to be adapted. If predictive and remote operation is to be achieved, it must be integrated into the product.

2. If the product is to be repaired remotely in real time, this will require a new sales service proposal, too. It is not the delivery of a product repair component, but a software update and product information to be integrate and share across the company.

3. All of these new capabilities will require a new set of skills, such as Big Data Analysis, Software Development, and Systems Engineering.

4. If the product is to be intelligent and connected, require security management for verification and storage. As products become intelligent and connected, huge amounts of data will be available and the way of interact

companies with customers will change. (Porter, M. E. A Heppelmann, J. E.: (2014))

These changes will lead to a change in the company's work, especially in product development, IT, production, logistics, marketing, sales and post-warranty service. Economists Porter & Heppelmann point out that new forms of cooperation in the company will emerge as well as its completely new functions. Data will become a significant source of competitive advantage, new techniques will need to emerge for their processing, Big Data, Internet of Things and so on.

### **New energy model**

Based on the results of a cost - benefit analysis within the meaning of Directive No. 2009/72 / EC (dated 13 July 2009) and the Slovak Republic started in 2013 according to the conditions in the Decree of the Ministry of Economy of the Slovak Republic no. 358 with the installation of smart metering systems, which should be built to support decentralized production and ensure higher energy efficiency. On October 30, 2017, the World Meteorological Organization announced a new record for atmospheric carbon dioxide concentrations at its highest level in 800,000 years, when global average CO<sub>2</sub> concentrations reached 403.3 ppm (parts per million) in 2017. Reversing developments so far requires a fundamental change.

Digitization, decentralization, digitization and decarbonisation have become paradigms for Europe's new energy model. The initiative is increasingly being taken over by active customers (so-called Prosumers), t. j. cities, industry, service providers or the general public who are most motivated to look for solutions to save energy and protect the environment. The need the most accurate information possible from all major appliances, be it buildings, public lighting or transport systems, as well as from



installations for the production and storage of electricity and heat is in these new economic models very important and urgent in real time.

Modern technologies from Industry 4.0, IoT or blockchain, which move the possibilities of implementing energy solutions closer and closer to real time, are very effective in this effort. Intelligent measuring systems (IMS) are also adapting to this trend, providing the possibility of connecting meters and other energy media (gas, heat ...) or other smart devices and enabling the sending of information on production and consumption in real time, thus providing data with analytical tools (so-called Big Data), whether with the form of personalized or so - called open data. IMS open up space for local prediction, control and modelling of complex energy management (so-called Microgrids) using integrated renewable sources, energy storages or charging stations for electric vehicles. All efforts should be aimed towards energy-efficient to self-sufficient communities and cities that are attractive to their people with a carbon-free and sustainable energy economy.

#### Clean energy package

Yet in November 30, 2016, the European Commission published a package of legislative proposals, the so-called "Winter package" or "Clean energy" package, in which she submitted proposals to change the organization of the electricity market, the so-called New market design. It includes a revised Directive on common rules in the internal market in electricity of 2009. However, it introduces some clarifications to the existing provisions on smart meters, published in particular Articles 19, 20, 21 and Annex III. It grants every consumer the right to request from smart meter a certain minimum set of functions. Adequate incentives and technologies are needed to exercise these consumer rights. Smart metering systems empower consumers by providing them with accurate real-time feedback on their consumption or production, which they can better manage; at the same time, they can participate in

consumption management programs and other services and take advantage of them as a reduction in electricity bills. In addition, smart metering provides distribution system operators with a better report of their network, thereby reducing their operating and maintenance costs, and these savings can be reflected in distribution tariffs that are ultimately pay by the consumer.

When EU is deciding about the deployment of smart metering at national level, it should be possible for the deployment of smart metering systems to be based from their economic evaluation. In order to promote the active participation of consumers in the electricity market, smart metering systems introduced by Member States on their territory should be interoperable, should not hinder switching and should be equipped with efficient functions that allow consumers to access in near real time, to its consumption data, to adjust the energy consumption and, to the extent that the support infrastructure allows it, to offer the system its flexibility, to reward it and to achieve savings in electricity costs, too.

#### Microgrids

It is important question, do microgrids have a future in Slovakia? Electricity market is in process a revolution. Decarbonisation, decentralization and digitization (3-D) are shifting the orientation to the energy chain towards the end customer. These possibilities create opportunities for new business models in the electricity market. One of them is the concept of microgrids, which are based on intelligent technologies. This solution enables active management of its production from only renewable sources (green electricity) and electricity consumption among end customers. It includes the storage of electricity within the smart grid and their billing of supplied surplus electricity to small producers. Subsequently again

there is space for another technological trend so called Blockchain.

Quo Vadis EU energy sector?

Changes are also expected in the area of "big" energy. Several European countries plan to change their energy mix. Even traditional nuclear France plans wants to gradually reduce its coverage of nuclear consumption from the current about 72% to the expected about 50%. This should become the phasing out of nuclear power units and their replacement, in particular, with renewable energy sources. However, according to Enel, such market volatility is the new normal state and new opportunities need to be to accept through asset digitization through 3 steps:

- basic applications (IMS, AMM, remote ERP management);
- sensors network Internet of Things (IoT) software in equipment's connected to the Internet;
- Big Data - located in the cloud.

New technologies represent revolutionary changes in energy technologies and also in their use. Modern technologies shorten innovation cycles and this creates pressure on investment. It is expected to increase the interest of customers in managing their consumption, and it is also may be expected to shift the load off-peak.

It is expected that cross-border traffic will continue to increase and local distribution problems will spread across borders, too. The increase in capacity to cover the demands of increasing cross-border flows is still unresolved. At the same time, price volatility and pressure for greater flexibility in cross-border supply are expected to increase. New technologies will require significant processing of large amounts of data and information through the use of Big Data, which will require legislative protection of data against misuse. Representatives of Belgian, Italian and German network companies presented pilot solutions in the field of big data and data flow management and efforts to achieve standards

for the use of data between Distribution System Operators (DSO) and Transmission System Operators (TSO). It is considered about the possibilities of creating one or more so-called Data Hubs, which should be a repository of an enormous amount of data, their processing into statistical forms and with access mechanisms. All players should contribute to such a system, and everyone should also have access, with the aim of access for all customers as well, as it will promote a competitive environment for suppliers.

New market players were also presented - an aggregator and prosumer, as little-known economic categories. The aggregator, is defined in the new market design, combines several customer loads for the purpose of selling, buying or auctioning electricity, while the independent aggregator is not connected to a traditional supplier. In essence, it should be the player who concentrates the virtual reserves of electricity with IT resources, thus increasing his flexibility and trading with them. Finally, it should also be able to provide support services.

Prosumer is actually a customer and a manufacturer in the one place and its energy management is not an energy business. Thus, it can also be a household with micro-cogeneration unit. Prosumers could work very effectively with the aggregator.

Information and Communication Technologies (ICT) will be a key prerequisite for the stated challenges of energy companies, in which most innovations will take place. The solution to the growing complexity of the market and the complexity of ICTs in businesses is the smart company. Cyber-physical systems (CPS) can build decentralized and autonomous networks that are organized independently and are optimized. The level of autonomy and decentralization is increasing with increasing complexity. To enable this development, the IT is undergoing a fundamental change from the traditional pyramid of monopolistic, unified systems to a service orientation called "everything as a service" (XaaS). It is a software deployment model where the application is hosted by the

service provider. The service is further offered to customers via the Internet. Eliminating the need to install and operate the application on their own devices SaaS has recently become a popular way to run the application. SaaS was created in response to the need to reduce costs by using SaaS, companies can also reduce the direct cost of purchasing software, as the cost of an on-demand license tends to be lower due a server license not required a payment. This paradigm shows that everything, whether physical or virtual, is offered as a service and comes from the three main layers of cloud computing services - software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).

The SaaS model brings significant benefits to both the customer and the supplier. The main advantage for both parties is that they share risks and rewards. From the customer's point of view, these are mainly the following benefits:

1. Initial costs are significantly lower.
2. The costs are known in advance and without surprising increases.
3. The service includes continuous software improvement and support.
4. The customer is free to choose to switch to another supplier if the service does not meet the expected benefits. However, it should be noted that the transition can be complicated.

5. Reduce additional costs and focus on core business. John Hagel III and Marc Singer (1999), who define the basic types of business (infrastructure management, customer relationship management and product innovation).

(Michel Treacy and Fred Wiersema (1992)) came to the similar conclusion that in their work on value disciplines (operational excellence, customer support) intimacy and product management) show that there are three main different strategies, by which they mean focusing on cost, customer and product innovation. Perhaps the only difference between the two approaches is that the study of value disciplines shows that there are very few companies that are able to excel in more than one discipline, even though the recommendation focuses on only one (industry leaders focused on only one discipline). (Hagel, J. and Marc Singer, M.: (1999)) While John Hagel III and Marc Singer argue that "range, speed and range cannot be optimized at the same time.

Build and manage facilities for high volume, repetitive operational tasks. High fixed costs make large volumes essential to achieve low unit costs. They stress standardization, predictability and efficiency.

Picture 1: Relations resulting from implementation digitalization

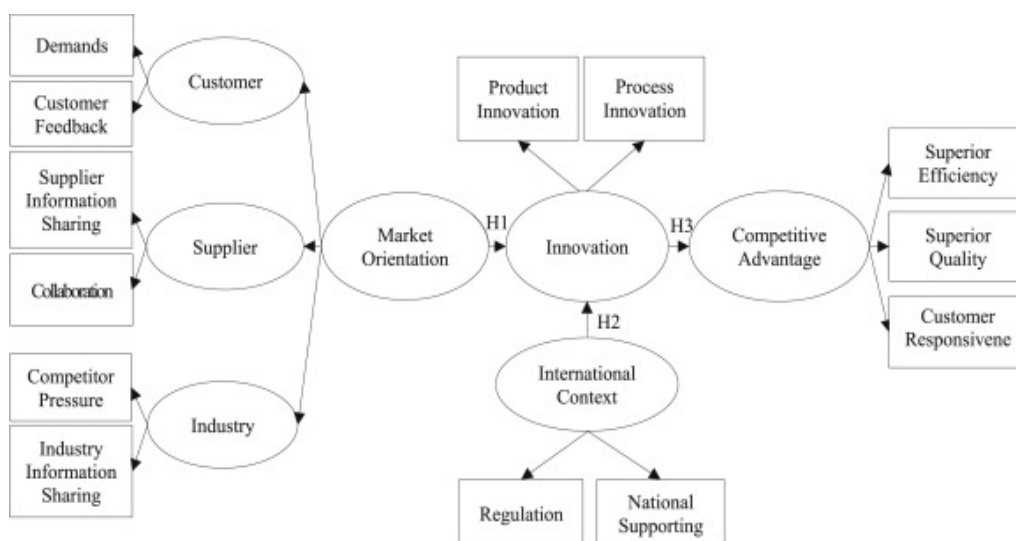


Source: Jensen, M. C. - Ruback, Richard S.: (1983: The Market for Corporate Control: The Scientific Evidence. [online]. Journal of Financial Economics, 1983, s.5-50 available on [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=244158](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=244158)inovácie

6. Customer Relationship Management (CRM): Identify, attract, and build relationships with customers. High cost of customer acquisition makes it imperative to gain large wallet share. Highly service oriented.

Product Innovation: Conceive of attractive new products and services and commercialize them. Early market entry enables charging premium prices and acquiring large market share.

Picture 2: Relations in new model in Industry 4.0



Source: <https://www.sciencedirect.com/science/article/pii/S2452315118300080>

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### Conclusion

Benefits of Industry 4.0 include improved productivity and efficiency, better flexibility and agility, and increased profitability. Industry 4.0 also improves the customer experience. In Industry 4.0 any investment you make in technology, improved manufacturing processes, or enhanced systems should deliver a return.

That means with Industry 4.0, the ROI opportunities are significant because of the benefits the technologies offer. This includes digital technologies that improve automation, communication between suppliers and customers, are the main benefits of Industry 4.0. Higher productivity concerned od Industry 4.0 technologies enable you to do more with less. In other words, you can produce more and faster while allocating your resources more cost-effectively and efficiently. Other examples of improved efficiency include faster batch changeovers, automatic track and transmission and distribution processes, and automated reporting.

Complying with regulations in industries like pharmaceutical and medical device manufacturing does not have to be a manual process. Instead, Industry 4.0 technologies make

it possible to automate compliance including track and trace, quality inspections, serialisation, data logging, and more.

### Better Customer Experience

Industry 4.0 also presents opportunities to improve the service you offer to your customers and enhance the customer experience. For example, with automated track and trace capabilities, you can quickly resolve problems. In addition, you will have fewer issues with product availability, product quality will improve, and you can offer customers more choice of services. Next advantage is reduction of costs. To achieve it, you need to invest, so there are upfront costs. However, the cost of implementing innovations at your facilities will dramatically fall as a result of Industry 4.0 technologies, i.e. automation, systems integration, data management, and more. Industry 4.0 technologies give you greater knowledge of the manufacturing process, supply chains, distribution chains, business performance, and even the products you manufacture.

This creates opportunities to innovate, whether that is changing a business process, developing a new product, optimising a supply chain. Many of the above points can result in higher revenues for your companies. For example, by fully automating your production line and implementing other Industry 4.0 technologies, you could add a new shift with minimal staffing costs to meet an uptick in demand or compete for a new contract.

### Shortly:

Better use of resources,  
Faster production of goods and providing services,  
Less machine and production line downtime,  
Fewer quality issues with products,  
Less resource, material, and product waste,  
Lower overall operating costs,  
Creates Innovation Opportunities.

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## GOVERNMENT ACTIVISM DURING A PANDEMIC

Martina JAKUBČINOVÁ

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### **Abstract**

*The COVID-19 pandemic can be described in modern history as a milestone in social development. It evokes strong emotions, fear, helplessness and a desire to survive. It changes our priorities, attitudes and behavior. It recalls the essence of the existence of the individual, society and the State. It shows what its citizens mean to the State and what their State means to the citizens. It helps identify the most vulnerable and strong points of all involved. The author of the article will try to summarize the situation and point out the State and its steps in the fight against the spread of COVID-19. For this purpose, the author decided to use available online resources from domestic and foreign environments. He processed the obtained data mainly through the use of analysis, deduction and statistical recalculations. Based on the results and monitoring of the situation, it outlined possible solutions and recommendations leading to the alleviation of the undesirable situation.*

### **Key words:**

*citizens, COVID-19, government, measure, pandemic*

**JEL Classification:** H83, H75, I00

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### **Introduction**

No one knows the future, but the current situation we are in does not look good. Its atypicality is noticeable from several sides. Instability and imbalances in economic and economic-social relations, deteriorating care and access to education, social and health care, declining incomes and rising deaths are the results of the COVID-19 pandemic. A pandemic that affects all of us, that is - citizens, States and the world. There is nothing to left, but to think about possible scenarios of development, assign certain probabilities to them and make decisions based on them. The State, as an authority, representative and precondition for collective protection, must act with particular responsibility for a given problem. The result of its activity should therefore be to find innovative solutions that can

minimize damage and maximize benefits. Times new roman (10)

### **Literature overview**

The COVID-19 pandemic represents the biggest global crisis not only in the field of public health in the last century (WHO, 2020, OECD, 2020a; World Bank, 2020). "COVID-19 is now the most severe health crisis since the Spanish Flu in 1918. The COVID-19 pandemic is wreaking havoc on the global economy, unleashing the worst economic downturn since the Great Depression" (UN, 2020). Director of the International Monetary Fund: "this is the only crisis that has managed to stop the world economy" Georgiev (2020). In addition, free movement or the current way of life have been rapidly tightened. Thanks to pandemic, we live in chaos, uncertainty and fear (Fig. 1.).

Fig. 1. Map of COVID-19 cases in time

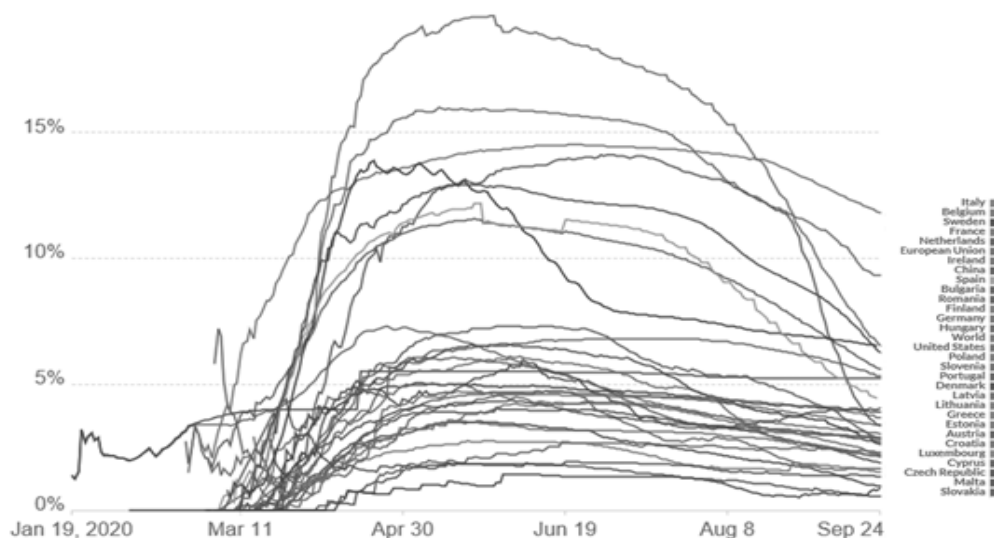


Source: John Hopkins University and Medicine, 2020

Pandemic can therefore be described not only as the biggest economic, but also the financial and social shock of the 21st century. Since its outbreak, almost one million people have died

worldwide (Worldometer, 2020; Ritchie et al, 2020, Graph 1), and 1.6 billion people have lost jobs as a result of the pandemic (Kretchmer, 2020, OECD, 2020b).

Graph 1. Case fatality rate of the ongoing COVID-19 pandemic



Source: ECDC, 2020b

Governments are aware of this situation and they are consciously taking unprecedented action (UNFPA, 2020; Eggers et al, 2020, ECDC, 2020a; Table 1.). The same statement is true for the EU and its Member States. They work together to strengthen national healthcare systems, take measures to mitigate the socio-economic impact of COVID-19, support the reconstruction and repatriation of citizens (almost 0.5 million Europeans). These and many other

acts test the collective responsiveness and attitudes of the involved. As stated by Josep Borrell, EU High Representative for Foreign Affairs and Security Policy (2020) "A global pandemic can only be solved globally, with united, swift and decisive global action." Osterhaus virologist tells Science magazine "What would be necessary is that we define one central policy in Europe. The problem is, who is going to do that? The European Union has little



power to coordinate health measures. ” (Kupferschmidt, 2020).

*Table 1. The most common restrictions*

| Measure   | Specification   |
|---|---|
| Cancellations of mass crowds                                | Specific events or the size of the meeting  |
| Closure of public areas                                     | Full closure of public areas etc.   |
| Closure of educational institutions                         | Nurseries, primary schools, secondary schools and higher education                    |
| ‘Stay-at-Home’ recommendations                              | The elderly, people with underlying health conditions but also the general population |
| Use of protective masks in public areas or public transport | Exception: people with health illnesses   |

Source: own research based on the documents of ECDC, 2020a

As stated in the United Nation briefing report (1 May 2020) "Since the World Health Organization declared COVID-19 as a global pandemic on 11 March 2020, nearly 80 percent of the global population has come under stay-home orders, lockdowns and quarantines, inflicting increasingly severe direct and indirect economic impacts. The global financial crisis disproportionately hurt lower income households in economies, as millions lost jobs and their most important asset, the homes. Labour-intensive service sector jobs are most directly hit by lockdowns. Retail trade, restaurants, sports, recreations and transportation became the first casualties, as the pandemic containment measures largely shut down economic activities in these sectors, which employ millions of low-skilled workers. "

It is important for States and communities to lend a helping hand to their people. We cite the European Union as an example. The EU is helping Europe and Europeans cope with the crisis as well as its devastating economic consequences through a number of measures (Table 2.). It is releasing billions of euros to address the issue in its entirety. It points to the

need to support health, education, the economy and the economic sector. „The European Commission has a new aid package, awarded nearly € 166 million, via the European Innovation Council (EIC), to 36 companies for fight with the coronavirus pandemic. More than € 148 million will be granted to another 36 companies to contribute in recovery plan for Europe, bringing the total investment from Horizon 2020 to € 314 million. It also contributes € 1.5 million to UNICEF COVID-19 response for vulnerable children and families in Syria.” (EC, 2020a. EC, 2020b, Unicef, 2020).

Commissioner for Health and Food Safety, Stella Kyriakides, said: “Today we propose to our Member States a well-coordinated, predictable and transparent approach to travel restrictions, always placing the protection of public health first. We must avoid further disruption of already fragile economies and additional uncertainty for citizens who have made huge sacrifices. They expect this from us after many months living with COVID-19.”

*Table 2. Key actions of the EU*

| Defeat a Global Pandemic             | Recovery the economic „Next Generation EU“  |
|--------------------------------------|---|
| Slowing the spread of the virus      | Providing massive economic stimulus   |
| Providing medical equipment          | Supporting EU health systems and infrastructures „EU4Health programme“  |
| Promoting research for a vaccine     | Protecting small and medium-sized businesses  |
| Repatriating EU citizens             | Mitigating unemployment risks „Support mitigating Unemployment Risks in Emergency (SURE)“ Supporting the tourism industry |
| Boosting European solidarity         | Banking package to support households and businesses  |
| Supporting the economy               | Supporting agriculture and fisheries  |
| Protecting jobs                      | Helping countries fund their crisis response  |
| Helping the EU's recovery            | Helping countries fund their crisis response  |
| Supporting partners around the globe | Relaxing state aid rules  |
| Fighting COVID-19 disinformation     | Protecting weakened European businesses from foreign competitors  |

Source: own research based on the documents of European Council, 2020; European Parliament, 2020

### Goal and Methodology

The main goal of the article is to acquaint the reader with the situation and solutions to the issue of the spread of COVID-19 in the world and at home. To find out the current state of development of this pandemic in individual States and to point out the role of communities in the fight against it. At the same time, our goal is to highlight the role and procedure of the government, as well as to draw attention to the need for state preparedness. To meet these goals, we decided to use the method of analysis and synthesis. We used mapping the situation by searching and retrieving data from public online sources. Subsequently, we used methods of mathematical-statistical recalculations, which clarified the developmental side of the spread of COVID-19. At the end, we used a deduction, based on the facts obtained in processing our observations and drawing recommendations.

### Findings related to Slovakia's response to the global pandemic COVID-19

The development of the situation in Slovakia is closely connected with the existence of policy heterogeneity, which characterizes our country. The Slovak Republic was caught by this issue at the time of the new government (ŠÚ SR, 2020, ÚV SR, 2020). This has greatly complicated the situation and increased our citizens' concerns for their health and lives (Actly Agency, 2020). Fortunately, the black scenario has not been confirmed (Congress, 2020). On the contrary, the actions and activities of the new government have put us at the forefront of the success in the fight against this virus. Slovakia was among the first countries to introduce radical measures against the spread of coronavirus. State authorities in the fight against the spread of COVID-19 acted quickly, unambiguously and without any hesitation (Bloomberg, 2020). Right at the beginning, the Government of the Slovak Republic declared an abnormal situation in the

Slovak Republic (Act No. 42/1994 Coll.) Valid from 12 March 2020 (Resolution No. 111/2020) due to the spread of COVID-19, subsequently declared a state of emergency (Act No. 42/1994 Coll.) valid from 16 March 2020 (Resolution No. 114/2020, Resolution No. 115, Resolution No.

116, Coll. 45/2020 Coll.). In addition, the new government has managed to implement several other measures so that the growth of citizens' confidence in the given steps is positively received (Table 3.).

Table 3. Government measures in the time of COVID-19

| Government measures  | Specific assistance to citizens  |
|--|--|
| Border closure – „traffic light“   | Financial contributions  |
| Obligation to wear a face mask and keep a social distance  | Postponement of filing a tax return forms  |
| Limitations in mass public activities  | Flexible suspension of Trades  |
| Mandatory quarantine   | Postponement of social and health contributions  |
| Recommendation of using eEnvironment   | Possibility to request a deferral of loan repayments   |
| Closure of educational institutions  | Entitlement to sickness and nursing at the time of the pandemic  |
| Regulations in the field of retail operations, catering providers, swimming pools, service providers | New special provisions in the Labor Code in the event of an emergency, emergency or state of emergency |
| Regulations in the field of operation of social and medical facilities                               | Temporary protection of entrepreneurs from bankruptcies, executions and creditors                      |
| Regulations for establishments, plants and workplaces  | Provision of bank guarantees under the program - SIH anti-corona guarantee                             |
| "Stay at home" recommendation  | Rental protection  |
| Assistance to employees, companies and other   |  |

Source: own research based on the documents of ÚV SR, 2020, MIRRaI SR, 2020

It is thanks to these quick steps that our government has managed to come to the forefront, among the safest countries in Europe (The Guardian, 2020). Bloomberg (2020) and

Schernhammer (2020) highlight citizens and their efforts to comply with quarantine measures and to monitor the contacts of each new case (Table 4.).

Table 4. Development of the COVID-19 situation in Slovakia

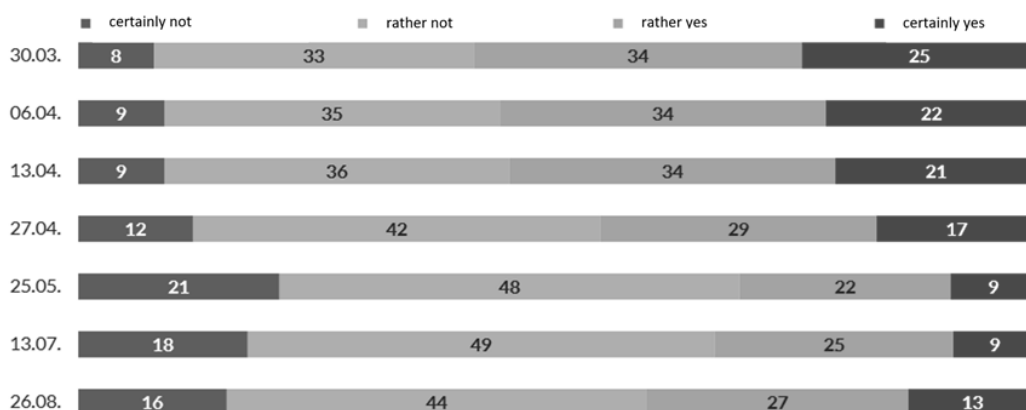
|           | Examined |           | Positive testing |         |          | Cured patients |         |          | Number of deaths |         |          |
|-----------|----------|-----------|------------------|---------|----------|----------------|---------|----------|------------------|---------|----------|
|           | total    | % growth  | total            | % ratio | % growth | total          | % ratio | % growth | total            | % ratio | % growth |
| January   | 3        | -         | 0                | 0,000   | -        | 0              | 0,000   | -        | 0                | 0,000   | -        |
| February  | 13       | 333,333   | 0                | 0,000   | -        | 0              | 0,000   | -        | 0                | 0,000   | -        |
| March     | 9097     | 69876, 92 | 400              | 4,397   | -        | 3              | 0,750   | -        | 1                | 0,250   | -        |
| April     | 91072    | 901,121   | 1403             | 1,541   | 250,75   | 558            | 39,772  | 18500    | 23               | 1,639   | 2200     |
| May       | 172875   | 89, 822   | 1522             | 0,880   | 8,482    | 1368           | 89,881  | 145,161  | 28               | 1,840   | 21,739   |
| June      | 211813   | 22,524    | 1687             | 0,796   | 10,841   | 1466           | 86,900  | 7,164    | 28               | 1,660   | 0        |
| July      | 264446   | 24,848    | 2337             | 0,884   | 38,528   | 1742           | 74,540  | 18,827   | 29               | 1,241   | 3,571    |
| August    | 337695   | 27,699    | 3989             | 1,181   | 70,689   | 2478           | 62,121  | 42,250   | 33               | 0,827   | 13,793   |
| September | 428308   | 26,833    | 7629             | 1,781   | 91,251   | 3978           | 52,143  | 60,533   | 41               | 0,537   | 24,242   |

Source: own research based on the documents of Korona, 2020

The State was not ready for the first wave of the pandemic, but we managed it very well. Slovakia has chosen a strategy of hard fighting. The closure of borders, the repatriation of citizens of the state, compulsory quarantine, the closure of

schools and shops, the ban on public events or the mandatory wearing of face masks can be considered correct, but for several reasons not fully completed (Graph 2.).

Graph 2. Feeling threatened by COVID-19



Source: Actly, 2020

State officials are trying to use a significant improvement in the epidemiological situation to prepare us for a possible second wave of the pandemic. As Krajniak (2020) states, "our aim is to eliminate the shortcomings and missing crisis manuals, which will serve as an aid in any unpredictable situation in the future."

For these reasons, it is important to implement a radical shift in all spheres and areas of social existence. The State must radically support and develop the issue of eEnvironment. This applies in particular to the provision of services guaranteed by the State (eGovernment, eHealth,

eEducation). It is also necessary to increase assistance to citizens (contributions, guarantees, claims, technical and material assistance) and to prevent the spread of misinformation. Adjust the perception and application of the principles of democracy (freedom of movement, contact, rights and obligations) so that it benefits collectively. If the State does not act as a guarantor of the functionality of these systems, there may be an increased threat to citizens from a financial and social point of view. These elements should therefore be the main topics of negotiations of individual departmental representatives. At the

same time, it is important for the State to enforce these acts on EU soil as well.

## Conclusion

History has never been friendly to us. Moments of happiness and joy were always replaced by a hard and ruthless blow of fate. Freedom is replaced by oppression; growth is replaced by fall. History is full of examples that work within certain cycles and rules. It is no different today. Pandemics have been, are and will be. However, a multi-round process of its attack must be taken into account. The first is sudden, unexpected and does great damage. However, the second is the one that is crucial and usually the most destructive. Therefore, it is necessary to constantly monitor the situation, test the readiness of the system, act in the interests of the team and the participation of all stakeholders to eliminate the undesirable situation right now. For this reason, the government of the Slovak Republic, the EU and the rest of the developed world are working on setting up modified systems and strategies designed to combat the spread of COVID-19. Their aim is to protect the health of

citizens and the existence of the State. By applying new trends, technologies and knowledge, they try to achieve this goal. Therefore, we would like to appeal to develop and support this issue. We see space mainly in the support of IT and eEnvironment (households, companies, the State). Also in preventing the spread of disinformation and assistance to citizens without any discriminatory elements (age, gender, education, financial security, etc.). It is essential that the younger, middle and older generation have guaranteed guarantees, which can only be given by the State demonstrating respect for citizens and their lives (health care, education, financial security, etc.). At the same time, it is important to adopt a single EU framework of measures that have emerged as most effective, even at the expense of economic loss. The unity of good practice must be paramount. The basis of everything is therefore a trust, mutual assistance and respect for each other (participation of the general professional and lay public, self-government, the State). The cornerstones of this project are healthy and solid, so it is necessary to approach the completion of the entire complex responsibly.

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## EVALUATING OF ECONOMIC VIABILITY OF LOGISTICS COMPANIES

Deimantė KARPAVIČIENĖ, Valentinas NAVICKAS

**Abstract**

*In the global economic conditions, ensuring the viability of logistics companies depends on a variety of external and internal factors that determine the need to systematically assess changes in these factors. A systematic approach to the modern interpretation of economic viability not only identifies critical factors that influence the viability of organizations, but also allows to develop an appropriate system of indicators to measure them. In order to achieve a high level of economic viability of a company, it is particularly important to apply new tools and methods that take into account not only internal but also external performance parameters. Globalization, new rules of competition and the movement of capital are creating the conditions, the need and the increasing demands for evaluation of economic viability. The need for evaluation economic viability is based on the ability of the organization to innovate, to adjust its actions and to develop the strategy, ahead of its competitors, to maintain high productivity in a long run. In this article, we have distinguished the main indicators and methods of evaluation, which are intended to assess the viability of the subject and thus to reveal the determinants of economic vitality. Relating on the theoretical analysis of factors and indicators, the evaluation model of logistics companies on evaluation of their economic viability is presented.*

**Key words:**

*economic viability, economic viability assessment, logistics sector, logistics companies*

**JEL Classification:** C40, C50, C52

**Introduction**

In today's economic climate, effective business development is crucial to ensure its viability. Enterprise development is a prerequisite for the emergency of new forms and innovations, which are closely linked to the formation of external and internal relationships. Although Lithuanian and foreign scientific works focus on the assessment of economic viability, it is not widely studied in the field of logistics companies. Many scientists and theorists define economic viability through the concepts of "efficiency", "sustainable development", "productivity" and "stability". The authors also present their interpretations of the terms "viability", "efficiency", "sustainable development", "productivity" and "stability".

Economic viability development issues have been analysed by Garbie (2016), Ionescu (2018), Rosha & Lace (2018), Savickiene (2016), Qerimi, Hajdar & Fejza (2017) and others. The economic viability of a company is usually understood as the balance between the

growth and sustainability of the company. "Viability" is a universal phenomenon, an essential element of any existing system. It is therefore difficult to define it in a single sentence to make it generally acceptable. This is why the authors present different concepts of viability. An important feature of viability processes is time, because development takes place in real time, and only time determines the direction of development.

It is important to emphasize that besides the complexity of the concept of "viability", the development process of logistics companies is greatly influenced by many external and internal factors, including economic, social, ecological, legal, political, technological and others. Although different classifications of economic viability determinants are presented in the scientific literature, there is a general agreement that the economic viability of logistics companies is largely determined by internal (controlled) and external (non-controlled) factors.



### **Theoretical Background. Factors of economic viability of logistics companies**

There are different classifications of factors determining economic viability in the scientific literature. When assessing economic viability, internal and external factors must be taken into account (Galinienė, 2015; Koleda & Lace, 2010; Savickienė, 2016). In some cases, contradictions can be discerned when it comes to material factors, but there are usually three groups of factors: economic factors, market factors and specific factors of the company.

Other scholars categorize factors as: competitive environment, globalization of industry, downward pressure on prices, consumer management, political position, technological environment, economic development, ecological environment (Minalga, 2008; Palšaitis, 2011); controlled factors, non-controlled factors (Palšaitis, 2010); physical, economic, social, political (Galinienė, 2015); economic-social and ecological environment (McKinnon et al., 2018) and so on.

Palšaitis (2010) divides factors into controlled and uncontrollable. According to Palšaitis, controlled factors include customer service, inventory, transportation and packaging. Non-controlled factors are divided into economic factors, competition, technology, geographical environment, socio-cultural environment, and political and legal environment.

Savickienė (2016) attributes human resources, social, financial resources, natural and man-made resources to internal factors. The

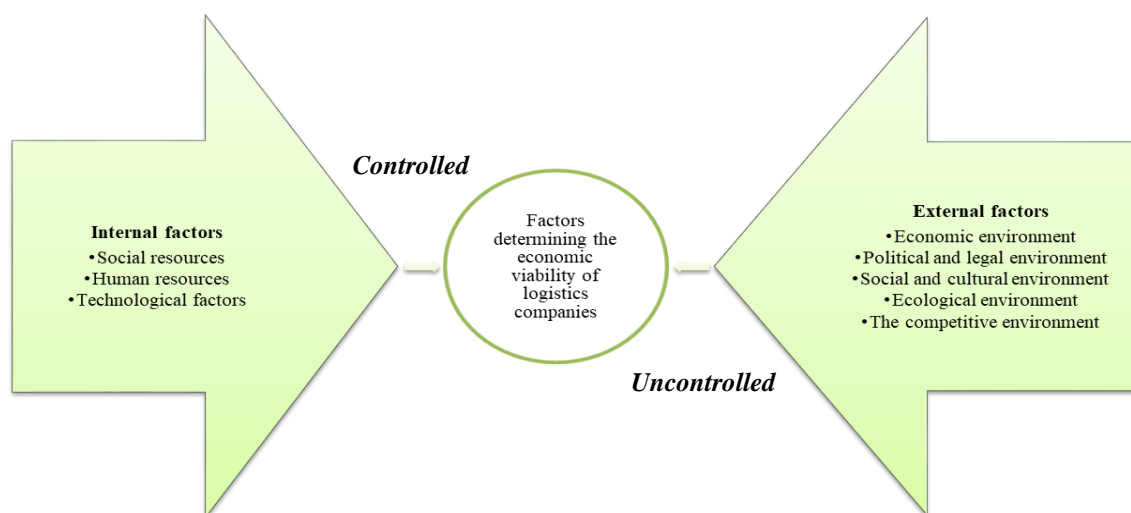
market and legal environment are attributed to external factors. Dziukevičius and Jonaitienė (2015), meanwhile, attribute the assessment of economic, political, legal, socio-cultural, technological, ecological and other factors that can have both positive and negative effects on a company's capabilities and state to external environmental factors. Internal environmental factors include the assessment of the company's organizational, managerial performance, personnel management policy, and financial analysis.

Sekliuckienė and Repečkienė (2014) classify the factors into microenvironmental (direct impact environmental) factors and attribute these factors to consumers, competitors, suppliers, laws, etc. Meanwhile, macro-environmental (indirect environmental) factors include economic, political, social and technological factors. The authors emphasize that the economic situation of the country is one of the most important components.

Galinienė (2015) distinguishes four groups of the following factors: 1) physical: natural and societal (non-natural) factors, 2) social: approach to development, development and ecology, 3) economic: main business directions, income from investments, the range goods and of services, (4) political: environmental policy, fiscal taxation and monetary policy.

The research conducted by the authors of the article shows that it is expedient to divide the factors of economic viability of enterprises into internal (or controlled) and external (or non-controlled) factors (see Figure 1).

Figure 1. Factors determining the economic viability of logistics companies



**Internal factors (controlled).** These are the factors that are caused by the company itself and depend on professional competence of the management, the organizational structure of the company, the ability and the efforts of the employees to work as a team and the internal control system. Avdeeva, Belyantseva, & Smorodina (2018) emphasize that the growth of sales revenue is accompanied by the efficient use of all resources and thus the best result is achieved.

The following internal factors affecting logistics companies are distinguished as social, human and technological factors.

**Social resources.** McKinnon et al. (2018) points out that in order to achieve the sustainability of the company the social aspect should not be ignored, that in order to achieve true sustainability, an organization should notice the value of its employees and encourage their capabilities. McKinnon also states that “human sustainability requires the integration of human resources policies and practices to ensure a long-term operation of the company and a positive response from the employees in the form of

equitable behavior, development and well-being” (p. 95).

Tekin, Bitiktas & Kilic (2017) emphasize the importance of ethics in the logistics sector and point out that the ethics of supply chain management focuses on business relationship interactions through ethical strategies and programs. One of the most common ethical problems in the supply chain is customers complaints on delivering a faulty products. However, if the supplier providing the product service is legally and de facto independent, the defect is passed on to the seller. Thus, a company with a well-established culture and good business ethics tends to be more socially responsible for logistics activities.

**Human Resources.** According to Chang (2015), the success of logistics companies is highly dependent on the productivity of human labor. Human resource management is very important for a logistics company. Respect for employee performance is an important aspect of HRM (human resources management). Its aim is to evaluate each employee’s contribution to the company’s operations. It is also an ongoing

process that evaluates the performance of each employee in relation to certain criteria and organizational goals. Taking into account the organizational achievements, strengths and weaknesses of employees, their salaries are adjusted in the future. The author (Chang, 2015) also proposes an analytical hierarchical process (AHP) approach to state the employee performance by the amount of work, organization skills, commitment, teamwork, communication and externalities.

Vasić, Potkonjak, Stanojević & Dimitrijević (2015) agree with Chang (2015) that the success of a company depends on human resource management and add that management systems are one of the most successful tools for implementing the quality of continuous increase of customer needs. In other words, human capital is one of the key factors in a long-term development of a company.

**Technological factors.** Improvement in modern tracking technologies to anticipate / predict congestion offer new opportunities for improving vehicle routing and the ability to dynamically change established routes to meet specific traffic conditions (McKinnon et al., 2018). Sekliuckienė and Repečkienė (2014) report the following technological variables:

- ✓ technological advancement;
- ✓ technology penetration;
- ✓ innovative infrastructure.

**External factors (uncontrolled).** These are factors that operate independently of the company.

**Economic factors.** The key elements of vitality, as well as their interactions, are largely influenced by economic changes (Galiniienė, 2015; Sekliuckienė, Repečkienė, 2014). Palšaitis (2010) also agrees that the economic environment is the most important of all external environments and separates out these impacts of the economic environment on logistics:

- ✓ companies may have problems with rising prices;

- ✓ in order to meet cash needs during the inflation period, more attention must be paid to improving the efficiency of individual logistics processes;
- ✓ long-term inflation and the downturn have a major impact on the company's sales revenue, which results in a drop in profits;
- ✓ due to the slowdown in market growth, logistics professionals need to carefully organize their operations to maximize productivity for each euro spent on logistics;
- ✓ the structure of the capital is significant because the excess of assets over the liabilities may cause the company to suffer considerable losses due to inflation. Conversely, companies benefit from inflation if their liabilities exceed their assets;
- ✓ foreign currency fluctuations may give rise to some uncertainty in decision making.

**Political and legal environment.** Galiniienė (2015) distinguishes from the stream of political factors: environmental policy, fiscal policy and taxation, monetary policy and industrial regulation. The expression of these factors includes cross-border agreements, legal regulations, restrictions and other documents that promote or restrict the volume of cargo transit, rail-port interoperability. These include economic development, the state of the economy as GDP, trade growth rates, and so on. (Palsaitė, 2005). Political-legal environment can affect a company financially, when political factors in a country negatively influence the expected movement of invested capital and eliminate the reasons for investing (Palšaitis, 2010). The author also emphasizes that if the company carefully analyzes the situation and takes certain protective measures, the political-legal aspects do not cause problems and do not increase the company's costs.

McKinnon et al. (2018) emphasize that the government has always intervened in the freight transport sector to correct market anomalies and intermodal competition. According to this modern scientist, “the need for freight movement is influenced by government policies related to the economics, industry, regional development, environment, energy, land use, waste recycling, for which various departments are responsible” (p. 316). The author also distinguishes the following seven categories of policy measures:

- ✓ taxes (fuel taxes, vehicle excise duty and road use tax);
- ✓ financial incentives (e. g. subsidizing the use of cleaner modes of transport);
- ✓ regulation (status of carriers, their tariffs, etc.);
- ✓ liberalization (for example, by allowing the owners of their own lorries to transport goods from other companies on the return journey);
- ✓ management governance of state-owned enterprises (in most countries freight companies are state-owned, so the government has a direct influence on them);
- ✓ infrastructure and land-use planning (planning of the land needed for logistics activities);
- ✓ advice and encouragement (e. g. promoting environmental practices in freight transport).

#### **Social and cultural environment.**

Social factors are those habits and behaviors that are determined by the way and state of society (Galinienė, 2015). This is the attitude towards law enforcement, governmental support, attitude towards development, development and ecology. Palšaitis (2010) identifies the following components of the socio-cultural environment that influence logistic management: language, religion, education, technology, politics, infrastructure development and regulatory

systems. The author states that a company must constantly monitor its business interactions with changes in the social environment in order to understand their impact on company's profitability, supply chain management strategies, outlets, market segmentation policy, and sales promotion.

Sekliuckienė and Repečkienė (2014) distinguish these social factors:

- ✓ availability of medical services;
- ✓ number and infrastructure of medical insurance companies;
- ✓ availability of accommodation services;
- ✓ cultural infrastructure.

#### **Research and Discussion. A set of indicators to measure the economic viability of logistics companies**

It is expedient to start evaluating the efficiency of the logistics company with the analysis of the composition of profit, its structure and dynamics. The further measuring of the performance includes sales, net profit, assets and return of capital.

- **Gross profitability of sales** is calculated using the formula (1):

$$\text{General profitability} = \frac{\text{Gross profit}}{\text{Sales revenue}} ; \quad (1)$$

Indicates the gross margin for each euro of sales. This allows to compare the results of competitive activity. Low indicator can express the company's pricing problems.

- **Net profitability of sales.** This indicator is usually calculated in

corporate practice and is calculated using the formula (2):

$$\text{The net profitability} = \frac{\text{Net profit}}{\text{Sales revenue}} ; \quad (2)$$

Displays the net profit of one euro of sales revenue. This shows the efficiency of the company. The higher the value of the indicator, the better control of all costs of the company.

- **Assets profitability** is calculated using the formula (3):

$$\text{Assets profitability} = \frac{\text{Net profit}}{\text{Property}} \quad (3)$$

Indicates pure profit fore ach euro of the company's all assets. Discloses whether the company is using its assets effectively.

- **Return on Equity (ROE)** is calculated using the formula (4):

$$\text{ROE} = \frac{\text{Net profit}}{\text{Personal capital}} ; \quad (4)$$

Indicates how efficiently the equity of the company is used (invested money and assets of the owners of the company), i. e. one euro of equity represents a net profit.

Boundaries for the assessment of profitability ratios to assess the economic viability of firms (see Table 1).

Table 1. Boundaries for the assessment of profitability ratios

| Indicators            | Profitability ratios, % |                   |                   |                  |         |
|-----------------------|-------------------------|-------------------|-------------------|------------------|---------|
|                       | Very good               | Good              | Satisfactory      | Unsatisfactory   | Bad     |
| General profitability | $x > 35\%$              | $35\% > x > 15\%$ | $15\% > x > 7\%$  | $7\% > x > 0\%$  | $x < 0$ |
| The net profitability | $x > 25\%$              | $25\% > x > 10\%$ | $10\% > x > 5\%$  | $5\% > x > 0\%$  | $x < 0$ |
| Assets profitability  | $x > 20\%$              | $20\% > x > 15\%$ | $15\% > x > 8\%$  | $8\% > x > 0\%$  | $x < 0$ |
| ROE                   | $x > 30\%$              | $30\% > x > 20\%$ | $20\% > x > 10\%$ | $10\% > x > 0\%$ | $x < 0$ |

To assess the ability of a company to meet its liabilities, the following solvency ratios have to be calculated: leverage ratio, equity ratio and leverage.

- **Debt coefficient** or otherwise known as gross debt ratio is calculated using the formula (5):

$$\text{Debt coefficient} = \frac{\text{All obligations}}{\text{All assets}} ;$$

(5)

Compares personal capital to the company's property. Allows to evaluate the company's ability to develop its performance without external sources of financing.

- **Financial leverage** is calculated using the formula (7):

$$\text{Financial leverage} = \frac{\text{Obligations}}{\text{Personal capital}} ;$$

(7)

Indicates how much of the company's profit is financed by credit funds. Very good if less than 0,3.

- **Property coefficient** is calculated using the formula (6):

$$\text{Property coefficient} = \frac{\text{Personal capital}}{\text{All assets}} ;$$

(6)

Indicates the amount of debt for each euro of personal capital, i. e. what part of funding is on credit. Big indicator indicates higher financial risks as the business will have to pay not only the interest but also pay back the debts.

Table 2. Boundaries for the assessment of solvency ratios

| Indicators         | Solvency ratio values |
|--------------------|-----------------------|
| Indebtedness ratio | 0,3< 0,7              |
| Equity ratio       | The higher the better |
| Financial leverage | ~0,5                  |

When evaluating the efficiency of the planned business it is expedient to calculate the following turnover ratios: total assets turnover, long-term and short-term assets turnover and equity turnover.

- **Turnover of total assets** is calculated using the formula (8):

$$\text{Total assets turnover} = \frac{\text{Sales revenue}}{\text{All assets}} ;$$

(8)

Indicates the amount of income for each euro of the company's property. The higher the indicator the more efficient the use of assets.

- **Turnover of fixed assets** is calculated using the formula (9):

$$\text{Fixed assets turnover} = \frac{\text{Sales revenue}}{\text{Permanent assets}} ;$$

(9)

Indicates the amount of income for each euro of permanent assets, i. e. how efficiently the company's fixed assets are used.

- **Turnover of current assets** is calculated using the formula (10):

$$\text{Current assets turnover} = \frac{\text{Sales revenue}}{\text{Temporary assets}}; (10)$$

Indicates how efficiently the company's short-term assets are used, i. e. the amount of income for each euro of short-term assets.

- **Equity turnover** is calculated using the formula (11):

$$\text{Personal capital turnover} = \frac{\text{Sales revenue}}{\text{Personal capital}}; (11)$$

Compares the sales of a company with its working capital. A low coefficient value indicates poor performance of capital efficiency.

Recommended thresholds for assessing performance are given in Table 3.

**Table 3.** Boundaries of performance measurement

| Indicators                | Sizes of performance indicators |               |              |                |         |
|---------------------------|---------------------------------|---------------|--------------|----------------|---------|
|                           | Very good                       | Good          | Satisfactory | Unsatisfactory | Bad     |
| Total assets turnover     | $x > 2$                         | $2 > x > 1$   | 1            | $1 > x > 0$    | $x < 0$ |
| Fixed assets turnover     | $x > 1,5$                       | $1,5 > x > 1$ | 1            | $1 > x > 0$    | $x < 0$ |
| Current assets turnover   | the higher the better           |               |              |                |         |
| Personal capital turnover | the higher the better           |               |              |                |         |

After analyzing these indicators described above, it is not difficult to compare the results of different companies' performance, to uncover the reserves and to present reasonable ways of company's management. This is one of the key tools for highlighting the economic viability of logistics companies.

### Conclusions

1. Economic viability is the ability of a company to innovate, to adjust its actions and to develop strategy ahead of its competitors, that can maintain high productivity in a long run. Companies that are able to maintain high

levels of business efficiency, sustainability, productivity and stability can at the same time ensure economic viability in a long run. Only a combination of these indicators can ensure good long-term results.

2. The main factors determining and changing the economic viability of logistics companies are divided into internal or controlled (social, human resources and technological factors) and external or non-controlled (economic, political-legal, socio-cultural, ecological and competitive environment).

3. The most widespread view is that economic viability can be objectively measured by logical and econometric methods of economic analysis and specific methods.
4. To assess economic viability, it is best to choose the following financial ratios commonly used in practice: profitability, operational efficiency (asset management), solvency (liquidity) and capital markets. In the analysis of these relative ratios, it is not difficult to compare the results of different companies, to uncover the reserves, and to present the results of the management of company. This is one of the key tools for highlighting the economic viability of logistics companies.
5. The methods and indicators most commonly used to assess economic viability are named and grouped in different ways. It causes the problem of the choice of indicators and methods for assessing the economic viability of a company. Different authors use different indicators to achieve the same goal. In addition, there is no integrated overall viability indicator consisting of the sum of the individual indicators described above, after evaluating the significance of each of them.

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## PROTECTION OF NATURAL CAPITAL IN SLOVAKIA

Peter NOVÁČEK

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### Abstract

*Natural resources or natural capital plays an important role in production processes. Each industrial sector uses the natural resources. In general, the protection of natural capital is perceived as the rational use of natural resources. At the same time, the efficient use of natural resources ranks forms part of the daily agenda of all states as part of their environmental policy. Current innovative industrial processes of companies are focused mainly on green investments and investment decisions of investors are made based on the need for environmental protection. This scientific thesis introduces the current system of protection of natural capital in Slovakia and at the same time it also clarifies the protection of natural interests in connection with the activities of foreign companies that carry out economic activity in Slovakia. The scientific study contributes to the clarification of the function of the state as the owner of the natural capital.*

### Key words:

*natural capital, regulation, green investments, environmental policy, economy sustainable*

**JEL classification:** Q5, Q57

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### Introduction

It should be noted at the outset that many businesses use minerals as basic raw materials within the production process. Slovakia is relatively rich in domestic mineral resources that are diverse, there is more than 600 exclusive deposits forming mineral wealth in Slovakia. There are large deposits of talc in Slovakia. The biggest producer of talc in the world is China, significant deposits are also in Finland. Within the framework of the extraction of mineral resources, emphasis is placed on the careful use of the State's mineral wealth in accordance with the principles of sustainable development. Current activities of the European Union within the framework of the protection of environment policy are primarily aimed at effective use of natural resources. This is evidenced by numerous secondary legislation adopted, as well as many programs and action plans adopted. This is evidenced by the large number of adopted secondary legislation, as well as many programs and action plans. The Slovak Republic as the Member State of the European Union conscientiously approaches the fulfillment of these obligations and, within the framework of environmental protection policy, focuses on the

sustainable use of natural resources and on minimizing the impact on the environment.

### Literature overview

Researchers introduce theoretical thresholds and clarify basic terminology or definitions of basic terms before commencing to examine a research problem. Authors Pan and Vira (2019) of the scientific study Exploring natural capital using bibliometrics and social media data, stress that they found 300 publications with the words "natural capital" in their title in the Web of Science databases, as of August 2018. In total, 774 authors authored a paper on natural capital, with an average of three authors per paper in year 2018. The number of papers published per year had risen from one paper in 1992 to 28 papers in 2017. The annual growth rate of publications was 12.2%. The citations of publications had been increasing rapidly, as well. In 1993, the number of citations per year were only three. However, the year 2017 marked a substantial increase in annual citations, when 1582 citations were reached." It is obvious nowadays, in addition, supported also by comparing the data in the year 2017 to previous years, that the topic of natural capital has been

targeted and tackled by numerous researchers, "classified in accounting as biological or natural assets" (Saxunová, 2019).

Our problematics relates to the mineral wealth or natural capital of the state. Scientific and expert articles, as well as textbooks use the term mineral resources or mineral wealth. The textbook with national importance by Rozložník et al. (1987) defines „mineral raw materials or minerals as non-renewable mineral resources - elements, compounds, minerals or rocks that can be used economically, directly or after modification for the needs of human society. Mineral raw materials can be solid, liquid or gaseous substances, which can be used in their original state or after their industrial procession. There are several basic groups of minerals. The most common are ores, non-ores and caustobioliths.”

Besides the definition of the most prominent Slovak scientists there is also legal definition of minerals. As minerals according to the Law no. 44/1988 Coll. on the Protection and Use of Mineral Wealth (so called Mining Law) as amended „is regarded solid, liquid and gaseous parts of the earth's crust and they are divided into reserved and non-reserved.” Within the mentioned Law the natural wealth belongs to the ownership of the Slovak Republic, more concretely it belongs within the competence of the Ministry of Economy of the Slovak Republic. The process of globalization and internationalization also affects terminology that which is adapted to new trends. The European Union in its documents and actions plans quite often uses the term natural capital in relation to environment or circular economy. For instance, environmental policy objectives include protecting, conserving and enhancing the EU's natural capital and protecting citizens' health and well-being from environmental risks and impacts. (The European Green Deal, 2020) At present, we will also quite often encounter the concept of a low-carbon economy in connection with sustainable development and green investment. The equivalent of natural capital can be assigned to the concept of mineral wealth, which we consider to be a source of raw materials and energy needed for the economic activities of enterprises. Natural capital in general can be understood as resources from nature (soil, minerals, water, air). Further to this

it is evident that the capital is not composed only of money, movable property, but also natural resources having value. Within the production process, natural capital is changed into economic capital. Natural capital is defined as the base of natural resources in a particular geographical area. It is composed of:

a) ecosystem capital, or ecological capital (Q), includes stocks of renewable resources (thus not used in economic processes), partially cultivated land, as well as ecological factors that are necessary for the functioning of the ecosystem

b) stocks of non-renewable resources. (Berkes and Folke, 1994).

From the above it is clear that there are two kinds of natural capital: renewable resources and non-renewable resources. Moldan (1994) defines the natural capital as „the sum of all natural resources that provide various services and goods to human society.” In addition author Moldan, Guerry et al. (2015) declare that, „natural capital refers to the global stock of natural resources.”

The Slovak Republic in accordance with it's the Constitution protects, saves and increases the natural capital of the EU while preferring its long-term sustainability. If we take a closer look at the various economic activities, we will be able to understand the extent to which this activity depends, directly or indirectly, on natural capital. In short, we could say that natural capital forms the basis for economic activity. Important are, for example, minerals such as bentonite, which is used to insulate water and seepage, for bedding for cats and other animals, and in the production of cosmetics. Large deposits of bentonit are located for example in Kremnica or in Hliník nad Hronom. The total extraction of natural capital in exclusive deposits in the observed period 2005 - 2018 recorded an increase until 2008 and after this year a decrease, which persisted until 2013. In 2018 the extraction of natural capital on exclusive deposits reached 30,7 mil. tons, which in comparison with 2005 represents the decrease of approximately 9,1 % and yearly increase of 2 %.(enviroportal, 2020)

### Goal and Methodology

Despite the fact that great emphasize is currently placed on investment, it still makes sense to

discuss how natural capital, or mineral wealth is used in Slovakia. The aim of this scientific article is to analyse the system of natural capital protection in Slovakia as well as the knowledge of practice, where international arbitration authority confirmed the right of the Slovak Republic to dispose of its natural capital.

The subject of this research is the valid legal regulation both at the national and international level on the protection of natural capital, the role of the state and the decision of the international arbitral tribunal that was issued in favor of the Slovak Republic

The scientific article offers both theoretical and empirical basis for understanding the role of the state in the protection of natural capital and what are the legal instruments at the national and international level securing the right of states to protect its natural capital.

In order to achieve this goal we have focused on solving these main tasks:

- a) studying of foreign legal regulation and national legal regulation on the protection of mineral wealth and identification of main resources in Slovakia,
- b) analysing the decision of international arbitration.

The methodological basis of this paper consists of secondary research. We have applied general

scientific research methods to process the paper - analysis and interpretation of legal acts, description, generalization and data synthesis.

### **European legal regulation of the protection of natural capital**

The European Union is an example to other international organizations in the field of environmental protection policy and the sustainable use of natural resources. The new EU Biodiversity Strategy for 2030 represents the complex, systematic and ambitious long-term plan for the protection of nature and reversal of ecosystem degradation. European environment policy rests on the principles of precaution, prevention and rectifying pollution at source, and on the 'polluter pays' principle. Multiannual

environmental action programmes set the framework for future action in all areas of environment policy. (Laka, 2019)

The basis for the Union protection of environment is formed by the provisions of Articles 11 and 191 to 193 of the Treaty on the Functioning of the European Union (TFEU). The European Union is competent to act in all areas of environment policy, such as air and water pollution, waste management and climate change. The regulation contained in the primary law is supplemented by the large spectrum of secondary legal acts of the European Union. An significant is secondary legal act the 7th Environment Action Programme to 2020 'Living well, within the limits of our planet', (Decision No 1386/2013/EU) The programme entail an obligation on Member States EU to protect, conserve and enhance the Union's natural capital. European Union environment policy rests on the principles of precaution, prevention and rectifying pollution at source, and on the 'polluter pays' principle. Europe's economy depends on an uninterrupted flow of natural resources and materials, including water, crops, timber, metals, minerals and energy carriers. (European Environmental Agency, 2019)

One of the most important is Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Green Infrastructure (GI) — Enhancing Europe's Natural Capital (COM 2013/0249. This Communication points out the insufficient protection of natural capital as well as the underestimation of the value of ecosystem services in the Member States of the EU. The Communication obliges Member States to treat natural capital with care and in accordance with the principles of sustainable development. Another current tool represents the European Green Deal (COM/2019/640 final). It also aims to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts. The European Green Deal is our plan to make the EU's economy sustainable (European Commission, 2020)

### **Protection natural capital at the UN level**

Protection of natural capital is provided by international multilateral conventions, treaties, charters, protocols or agreements with environmental focus concluded by various international organizations (UN, EU, OECD) as well as in bilateral international treaties with environmental focus. The activities of international community are represented by the creation of more than 200 international legal environmental norms and standards. The international regulation of the protection of natural capital contributes to the effective handling with natural resources in the states. From among these conventions, documents and treaties we would like to point out the Charter of the Economic Rights and Duties of States (UN) and International Covenant on Civil and Political Rights (UN).

The United Nations Organization already from its outset has adopted several conventions, as well as documents of different legal nature, in order to develop cooperation between the states.

Legal regulation at the international level has an impact on further development of political, economic, social and cultural relations between the states. The UN Conference adopted on 18 May 1972, Resolution 45 (III) by which it decided to establish the Working Group on the Charter of the Economic Rights and Duties of States entrusted with the task of drawing up the text of a draft charter on economic rights and duties of States. The General Assembly adopted resolution 3281 (XXIX) containing the "Charter of Economic Rights and Duties of States" on 12 December 1974, by 115 votes to 6, with 10 abstentions. (UN, 1974) This International Instruments in Chapter I contains the reference to the "fundamentals of international economic relations," chapter II lists the "economic rights and duties of states," and chapter III considers the "common responsibilities towards the international community."

The Charter establishes the right of states as the right of territorial sovereigns to decide on the legal regime of states and to manage their own natural resources. The Charter at the international level establishes the right of states to decide on the use of their own natural capital while requiring this capital be used rationally.

Numerous significant documents have been adopted at the UN level, including International

Covenant on Civil and Political Rights (adopted and opened for signature, ratification and accession by General Assembly Resolution 2200A (XXI) of 16 December 1966

entry into force 23 March 1976, in accordance with Article 49). According to Article 1(1) of International Covenant on Civil and Political Rights:

„All peoples have the right of self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development“. This provision contains the right of states to determine their future economic development on the basis of free their choice. The provision of Article (2) contains the right of all nations to freely dispose of their natural wealth and resources. States, on the basis of this provision, decide on the use of domestic resources of minerals further to the long-term needs of economic and social development of society. States create conditions for the development of extraction and use of domestic mineral resources. The effective use of mineral resources is influenced by numerous changing factors: volume and quality of raw materials, conditions of extraction, built infrastructure, liberalization of the market, etc. The Slovak Republic is the member state of several international organizations. Within the meaning of Article 1(1) of its Constitution the Slovak Republic acknowledges and adheres to general rules of international law, international treaties by which it is bound and its other international obligations.

### **National legal regulation of the protection of natural capital**

The use of domestic sources of mineral resources forms part of the national economic policy of the state. The function of the state in the field of environmental protection as a function of environmental care was regulated as early as 1955 by the Law no. 1/1955 Coll. on the State Protection of Nature. This law stipulated the obligations of the State to protect nature as a whole, including the results of human activities in nature aimed at its improvement. At present, the basis of the legal regulation on mineral wealth is the Constitution of the Slovak Republic, which stipulates in Article 4 paragraph

l that : „mineral resources, caves, underground waters, natural healing springs and waterways are the property of the Slovak Republic”. Subsequently, this provision imposes the obligation on the Slovak Republic to protect and enhance its mineral wealth so that it is used sparingly and efficiently, especially for the benefit of its citizens and future generations. As mineral wealth is non-renewable, it has to be protected and used effectively. The function of the state as the owner in this context is given and therefore the state also has a duty and responsibility for the efficient and careful management of mineral wealth. Its function is that the competent authorities, mining authorities, institutions responsible for environmental protection, take measures to ensure the rational use of mineral deposits. At the same time the state by its policy regulates the use of mineral resources, and defines and control the respective limitations. The Ministry of Economy of the Slovak Republic, as the state administration authority, manages the performance of state mining administration. When issuing mining permits, emphasis is placed on the introduction of modern technologies into mining. By mechanization and automatization the share of physically strenuous work is reduced and the share of mental work is increased. In mining industry the productivity of work depends not only by the level of used technique and technological procedures, but also by the labour force, through its knowledge, skills, attitude to work, diligence, responsibility, as well as by mining and geological conditions in which the mining takes place.

The constitutional law no. 306/2014 Coll. was adopted in year 2014, which amended article 4 of the Constitution of the Slovak Republic by adding new paragraph 2 as follows: „The transport of water taken from water bodies located in the territory of the Slovak Republic across the borders of the Slovak Republic by means of transport or pipelines is prohibited: the ban does not apply to water for personal consumption, drinking water packaged in consumer packaging in the territory of the Slovak Republic and natural mineral water packaged in consumer packaging in the territory of the Slovak Republic and to the provision of humanitarian and emergency assistance. The details of conditions for the transport of water

for personal use and for humanitarian and emergency assistance shall be stipulated by the law.” The constitutional protection of water applies to the transport of water across national borders and to the transport of water by means of transport or pipelines. An exception is mineral water for consumption or bottled one. In this context, the attitude of the legislator can be assessed positively, because water represents the natural wealth of the state and is considered a strategic raw material, which is used in almost all production processes and is also used by service providers. From the environmental point of view it of fundamental importance for the long-term sustainable development of regions. The legal basis for restricting the transport of water across borders is also the provision of Article 36 of the Treaty on the Functioning of the European Union, which enables the Member States to impose limitations to free movement of goods on the basis the protection of health and life of humans, animals or plants, and public security. In this context we have to point out the fact that according to the law no. 44/1988 Coll. on the Protection and Use of Mineral Resources considers as mineral resources the solid, liquid or gaseous parts of the Earth's crust (article 2 paragraph 1). Water is not consider as mineral with the exception of mineralized waters, from which reserved minerals or natural healing waters and natural table mineral waters may be extracted industrially, although some specific minerals, medicinal muds and other products of natural medicinal resources may be extracted from them industrially (article 2 paragraph 2 the law no. 44/1988 Coll).

Natural capital is closely linked to the protection of environment. In accordance with article 44 paragraph 1 of the Constitution of the Slovak Republic everyone has the right to a favorable environment. In article 44 paragraph 3 of the Constitution of the Slovak Republic it is stipulated that no one may endanger, or damage the environment, natural resources, and the cultural heritage beyond the extent laid down by law. Based on the above, it can be stated that this represents a constitutional right to environmental protection. The right to environmental protection is a separate fundamental right of a natural person. Article 44 paragraph 4 of the Constitution of the Slovak Republic stipulates: “The state looks after a cautious use of natural

resources, ecological balance, and effective environmental care.”

Careful use of natural mineral resources means the obligation to protect and rationally use mineral resources with a view to preserving reasonably similar opportunities for future generations. When using mineral resources, it is necessary to respect the principles of sustainable development and the requirements for the careful use of natural resources. The Slovak environmental policy is in full accordance with the trends of solving environmental problems within the UN, the Council of Europe and the European Union.

### **Protection on natural capital in context international investment arbitration**

Slovak environmental policy is in full accordance with the trends of solving environmental problems within the UN, the Council of Europe and the European Union. The subject of dispute between Spółdzielnia Pracy Muszynianka v. Slovak Republic PCA (Case No. 2017-08) was the protection of natural capital of Slovakia – mineral water from the spring in the municipality of Legnava in the district Stará Ľubovňa. From the genetic point of view the natural mineral water in Legnava belongs to the petrogenic, carbonatogenic type. The basic process of creating the chemical composition of groundwater is the dissolution of carbonates. The natural mineral water created in this way in Legnava (border village) is moderately mineralized, bicarbonate, calcium-magnesium, iron, carbonic, weakly acidic, cold, hypotonic (e-obce.sk). The Polish producent of this mineral water – company Muszynianka Spółka z Ograniczoną Odpowiedzialnością (ul. Kościuszki 58, 33-380 Krynica Zdrój) has been established in Slovakia already 10 years ago with the aim of bottling and distributing mineral water from a spring Legnava. This intention of the investor was not realized, however, the Polish investor came up with a new investment plan to build a pipeline from Slovakia to Poland and to transport mineral water through the pipeline to Poland and fill bottles there for sale. The Polish investor Muszynianka, in order to protect his rights, used the possibility of arbitration and referred the matter to an international arbitral tribunal. As legal arguments were stated the violation of the provisions of the Agreement

between the Slovak Republic and the Republic of Poland on the Promotion and Reciprocal Protection of Investments (Collection of Laws no. 27/1997 ). This Agreement entered into force as of the day following the second notification, i.e. on 14 March 1996, further to its article 12. The Agreement provides for the legal basis for international cooperation in the field of investment policy and movement of capital. At the same time it regulates the provisions related to the protection of investments, to fair treatment with investments, as well as to national treatment and most-favoured-nation treatment and fair and equitable treatment, and last, but not least, the compensation in the event of expropriation. The right to protection of the rights of the investor is granted on the basis of a bilateral investment treaty and the right to a fair trial. Current legal theory as well as contractual practice in the field of investment recognizes the substantive rules formed by the provisions on the protection of foreign investments and procedural rules belonging to the realm of international arbitration (procedural provisions). Article 1(5) of the Agreement stipulates that in case of Slovak Republic: the territory of the Slovak Republic over which the Slovak Republic exercises sovereign rights in accordance with international law. It is clear from the above that the Slovak Republic has the right of a territorial sovereign to administer natural capital and to determine its use. This obligation also results from the Constitution of the Slovak Republic (Law no. 460/1992 Coll.).

In its action, the company Muszynianka demanded from the Slovak Republic the payment of damages in the amount of almost 170 million euros on the grounds that the provision of Article 4 (2) of the Constitution of the Slovak Republic regulating the export of unpackaged mineral water is in conflict with international law (MF SR, 2020). The arbitration tribunal in its award stated that the provision on water protection and mineral water regulated in the Constitution of the Slovak Republic (Art. 4 (2) does not constitute a violation of the bilateral investment agreement (1996). This arbitration award confirmed the right of the territorial sovereign of the Slovak Republic to freely dispose and protect its natural capital. The legitimate expectations of the applicant in the form of compensation of damages were not met.

However, in the light of international investment theory and practice, the applicant's right was formally restricted with regard to the provision on fair and equitable treatment. Ultimately, the investment plan for transportation of drinking and mineral water transported from Slovak to Poland could not be realized because natural capital was at stake, the protection of which is stipulated by the Constitution of the Slovak Republic and the State has a duty and responsibility to protect its natural capital, as it is its owner.

### Conclusion

Legal regulation aimed at protection of natural capital of the states is of significant importance in the current process of globalization, because it establishes the right for states as owners to regulate the extraction of natural resources. The Slovak legal regulation explicitly stipulates. Its main role is to protect, enhance, and pay attention to the effective use of natural capital. At the same time it has to respect all international obligations in bona fide. Decisions of arbitral tribunals are also of some importance, as a result of which precedents are being set influencing the behavior of investors in connection with the implementation of the investment plan concerning natural capital, where the co-operation of national authorities is required. The Slovak Republic does not prevent any investor from using the right to a fair trial as an effective mean of redressing the economic damage, nonetheless the applicants' expectations are not always met. The right to a fair trial implies for all parties the right to acquaint themselves in the proceedings with any

document or application submitted to the tribunal by the other party, as well as the opportunity to comment on it. The right to a fair trial is one of the components of the right to a fair arbitration. Current arbitration practice proves that arbitrators approach dispute resolution responsibly. The high quality of the decisions of the investment tribunal represents the quality ensuring the correct result as well as the enforceability of the decision. The Investment Tribunal emphasizes the "quality" of the decisions taken, not the "productivity". The quality of the arbitral tribunal's decision is determined by the quality of the reasoning, which must be legally and argumentatively coherent, clear, unambiguous and inconsistent.

### Acknowledgments

The use and protection of natural capital is the subject of legislation at the national and international level. In carrying out its activities, the state is obliged to ensure the efficient and rational use of natural capital. The state, exclusively, provides the regulatory tools to set the conditions for the use of natural capital, its protection and prevent inefficient economic use. Through one's intervention in nature, one should seek a balance between the protection and use of natural capital in the course of economic activities. Natural capital is scarce and limited and therefore its use in economic activities should respect the principle of sustainable development, which preserves the current and future generations to meet their basic living needs and preserve the natural functions of ecosystems.

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## THE IMPORTANCE OF EDUCATION AND THE THREAT OF UNEMPLOYMENT IN THE CONDITIONS OF THE DIGITAL ECONOMY

Veronika ŽÁRSKÁ

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### Abstract

*The current pace of progress raises widespread concerns about rising technological unemployment. One of the ways to face it will be to adapt the skills and abilities of workers to the new conditions. However, the development of digitalisation does not only place new requirements on traditional education systems, which are no longer able to train workers with adequate skills, but are also expected to lead to a change in the legal regulation of industrial relations. The aim of the article is to theoretically define what changes digital transformation brings to society, what is its essence and what impact it can have on the growth of unemployment. In addition, from the statistics available at Eurostat, to find out the situation in selected European countries in terms of internet accessibility and the digital skills of the population, as these are key indicators for the introduction of digitization elements, and to highlight how the last fifteen In recent years, the unemployment rate in the Slovak Republic developed depending on the level of education attained.*

### Key words

*digitization, digital skills, education system, Slovak Republic, unemployment*

**JEL Classification:** E24, I21, O30.

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### Introduction

Digitization and the processes taking place in its background have significantly affected the system of functioning of the world economy. It has already been shown in the past that each new discovery has a significant impact on the overall operation of society. Whether it was the invention of the steam engine, the discovery and use of electricity or the development of information technology, the global economy has always seen a shift to a new level. The fastest progress was made by those countries that were able to implement current trends in a short time. A similar scenario is expected today. Leaders are those countries that create the best conditions for the digital transformation of economies. Competent world institutions have responded quickly to these new realities, and more and more indicators are emerging that assess countries' progress in this area, identify their shortcomings and seek to identify areas where investment is needed and their development to start. Outdated education systems, which are unable to produce graduates with the skills required by a constantly changing environment, often become a problem. A visible obstacle to digital transformation is, in particular, the absence of digital skills in a relatively large part of the population. Inadequate, outdated skills, together with declining jobs due to automation, make it more difficult for people to access

employment, leading to technological unemployment becoming a relevant threat. It does not affect all people in the same way, but it mainly affects low-skilled people or the older generation. Without an adequate level of education systems, it is difficult to ensure the required level of skills and abilities of employees, and in this context it becomes a great challenge to rework traditional education systems into the new conditions resulting from the digital transformation of society. The Slovak Republic will also have to deal with this difficult task and try to solve these problems as effectively as possible.

### Goal and Methodology

The main goal of the paper is to point out the changes brought by digitization processes in education systems, to evaluate the readiness of selected countries to implement these changes and to show that in recent years in Slovakia there is a positive relationship between education and employment opportunities. In order to achieve this goal, we studied several theoretical publications dealing with the issue, which we supplemented with statistical data available on the websites of the competent institutions. In working with these theoretical and statistical

sources, we used general scientific methods such as analysis, synthesis, deduction, induction or comparison.

## 1. Digital economy

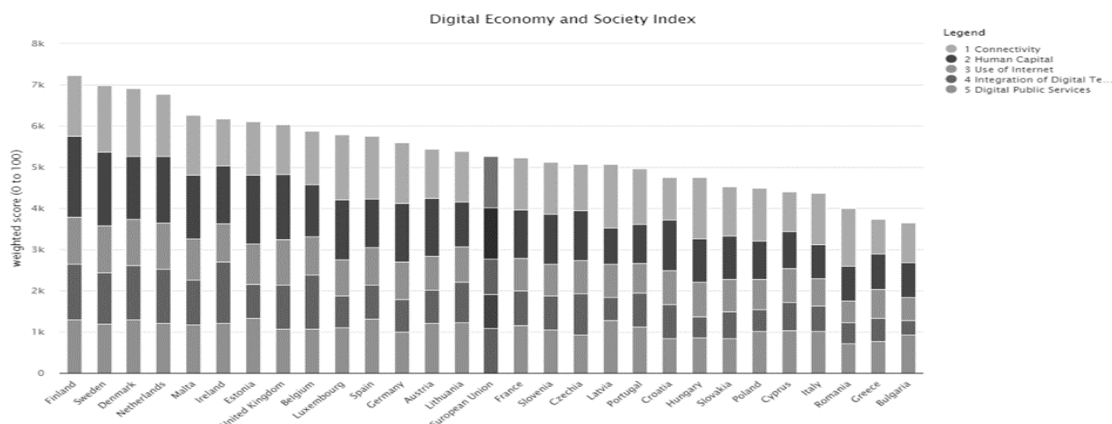
The digital economy is closely linked to the significant spread of information and communication technologies in all areas of human activity and is linked to other trends in the world economy, such as Industry 4.0 concept. On the one hand, it is a huge opportunity for the development and progress of individual economies, it leads to increased productivity due to the increasingly massive automation of production processes. On the other hand, it poses a threat to employees, as it gradually loses more and more jobs and brings with it new requirements for the qualifications of workers. All these facts also place new demands on the governments of the countries affected by the transition to the digital economy. It is mainly about the adaptation of laws, respectively. regulation of the new system of operation in conditions that are absolutely different from those to which we have been accustomed for decades. The digital transformation of the economy is expected to bring business

development, growth in competitiveness, added value, living standards and the well-being of society as a whole. However, this whole gradual transition will be accompanied by many issues, obstacles and problems that will require increased attention.

### 1.1 Expressing progress on digitization

In connection with the changes brought about by digitalisation, there is a tendency in the world to express the ability of individual countries to implement its elements. Within the European Union, the Digital Economy and Society Index (DESI) is compiled annually, which assesses the development of individual EU states in accordance with the effectiveness of their transition to the digital economy. The DESI index includes 34 indicators, which are divided into 5 groups and 3 levels. The overall index is calculated as a weighted average of the five main groups, each with its own weight: connectivity (25%), human capital (25%), internet use (15%), digital integration (20%) and digital public services (15%). Its aim is to identify, for each country, areas that are underdeveloped and require priority action and investment.

Figure 1: Digital Economy and Society Index in 2020



Source: European Commission

Among the 28 evaluated European countries, the Slovak Republic ranked 22nd below the EU

average in 2020. The best in this evaluation were the Scandinavian countries, the worst countries

in the area of South-Eastern Europe. The results of the countries are therefore similar to those shown in the indicator "households' access to the Internet", which we will deal with in the next part of the article.

The disadvantage of this index is that so far there are no studies and analyzes that would evaluate the relationship between the values of the index and economic development in individual countries (Stavytskyy, Kharlamova, Stoica, 2019). Even in this period, therefore, the answer to the question that seems clear at first sight, whether digitization is a source or a consequence of the economic boom of countries, remains unclear. On the one hand, digital technologies cannot be deployed without an adequate level of knowledge, skills and competences; on the other hand, opportunities for their deployment depend on economic development. Thus, the controversy that began in the second half of the 20th century continues, when Randall Collins deviates from the thesis of the interaction between economic growth and increasing the level of human capital. He argues that even a high level of education does not bring anything to the economy, but on the contrary, rapid economic development in recent decades has created sufficient resources to invest in education, and therefore the two categories are now mistakenly linked together (Collins, 1979). The increase in the number of educated is a consequence and not the cause of the economic growth of any country. He also argues that most professional experience can be gained by a worker directly in practical life and does not require unnecessarily long studies. However, Collins's theory deviates absolutely from many other economists who disagree with it. Most share the view that the higher a person's education, the higher his or her productivity and thus the more he or she contributes to growth. While Collins's view is partly accepted, especially the part where he emphasizes the need for practice, we believe that without lack of training, employees may not be able to handle the tasks assigned, they may be less reluctant to participate in further training that requires constantly changing conditions and rapid introduction of innovations, after losing a job they may have a bigger problem finding a job again, and so on.

## 1.2 New demands placed on education systems

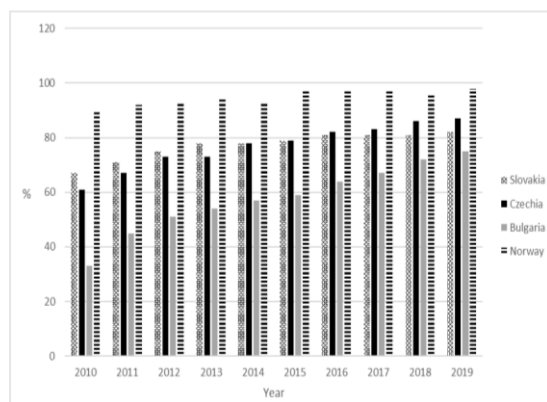
A visible radical shift towards other ways of organizing economic activity will be essential throughout the digitization process (Sundararajan, 2016). This will also require the modernization of education systems, which will need to be able to prepare people for emerging new positions. It will no longer be possible to keep them preserved in one form for several years or even decades. Permanent changes in technology and technologies will force the constant innovation of these systems, so that they are able to increase the competencies of future potential employees as effectively as possible in accordance with the requirements of the environment. For the time being, however, they are more aware of their inability to respond to these changes around the world. In the context of the digital economy and the closely related concept of Industry 4.0, there is increasing talk of education 4.0, which should be four-dimensional and include vocational education, business education, financial education and digital education (Sima, Gheorghe, Subic, Nancu, 2020). Digital education seems to be the most important, but only education in all key areas will lead to the expected results in the future. Employees will be required to understand the network system, become familiar with the technology of things, and be able to adapt to human-machine interactions in a new context.

## 1.3 Internet access - the basis for digitization

It is not necessary to focus only on what knowledge, skills or abilities new positions will require and thus in which direction the educational process should be oriented. Attention must also be paid to technologies that bring fundamental changes to the learning processes themselves. The personal presence of the lecturer at the training or similar teaching process is no longer necessary, but the whole procedure can be carried out online using the innumerable information and communication technologies that are currently available. And

here it is possible to meet with a close connection between two areas - in order to be able to implement education in this way, people must master the technologies used in it. Consequently, there is a need to invest adequately in digital infrastructure (Sundararajan, 2016). The basis of all ongoing processes here is a sufficient expansion of access to the Internet, because networking becomes a prerequisite for functioning in a digital environment. In addition, today his mastery is one of the skills of basic literacy, which includes the ability to read, write or count. In developed countries, Internet access is generally widespread, although in almost all of them, population groups that do not control it can be found. However, it remains a problem worldwide. Despite this fact, the growth in the number of people with access to the Internet has been slowing down in recent years.

**Figure 2: Level of internet access - % of household**



Source: <https://ec.europa.eu/eurostat>, own processing

The above chart evaluates the development of Internet access in the last ten years in the Slovak Republic and three other European countries, in order to assess how individual countries are trying to create conditions for the introduction of elements of digitization. In the Slovak Republic, as in many other European countries, more than 80% of households have access to the Internet (82% in 2019). Most countries are around this value, with a significantly higher share in the

Scandinavian countries, Luxembourg and Iceland. E.g. in Norway it was up to 98% of households in 2019. However, what is more interesting to observe is the pace at which this share has increased in the last ten years in the monitored countries. The most significant jump was recorded in Bulgaria (from 33% in 2010 to 75% in 2019). It can therefore be assumed that, like other countries, it is trying to create conditions for the implementation of elements of digitization and subsequent other processes. The need for progress in this area was also confirmed by the sudden change in the functioning of all institutions as a result of the Covid-19 pandemic. Personal contact became a thing of the past, handling most of the affairs was moved to the electronic environment, and many employees suddenly began working through the home office. For many, this transition was challenging, as they had to learn to work with ICT in a short time, which they had used only marginally before, or in many cases not at all. As it turned out during the first months, such a system of operation has proved its worth to institutions and companies. The pace at which they introduced elements of gradual electronization and digitization has accelerated considerably, which can be considered one of the few positives that the coronacrisis has brought.

#### 1.4 Digital skills

Digital skills represent a set of competencies on the basis of which an individual can evaluate in various situations whether and how to use available ICT (Kollár, Polakovič, Gasperová, 2015). At present, it is no longer possible to develop any further competences without developing digital skills, as digital technologies affect almost every area of our lives. However, despite certain technological progress, the level of these skills remains low for certain sections of the population. These are often people with a low standard of living or the older generation. This is a problem for the future, especially as regards their integration into the labor market. Although countries are gradually developing strategies to address this situation, it will be a lengthy process and the effects will be delayed. The situation in the Slovak Republic has changed only minimally in the last period.

Almost half of Slovaks do not have basic digital skills (46%). Compared to many other countries, this number remains relatively high. For 17% of Slovaks, it was not even possible to assess the level of these skills, as they had no access to the Internet in the last 3 months. Since 2015, this indicator has improved only slightly, which means that it will be problematic for the Slovak economy to quickly implement new trends, which are based mainly on digital technologies. As for the situation in other European countries, it is different. Significantly better is e.g. in Iceland, where only 15% of the population does not have basic digital skills, in Norway it is 17%. On the contrary, the worst situation within European countries is in Bulgaria, where 71% of the population does not have basic digital skills and in Romania 69% of the population. This result is not surprising, as access to the Internet was relatively rare in the two countries a few years ago and digital skills are closely linked to its use.

## 2 Digital transformation of economies and unemployment

Unemployment is a socio-economic phenomenon linked to the labor market, occurring in every economy. It negatively affects not only economic processes but also the personal lives of the people it affects. In connection with the development of digitization and automation, there are growing concerns about the increase in technological unemployment in individual countries. However, they are often exaggerated, as it turns out that even though many jobs are being lost, many new ones are being created at the same time. In addition, account must be taken of the fact that the mere possibility of automation does not mean that it will actually be introduced, as there are certain economic, social, legal and other regulatory constraints that cause long delays between the invention of new technologies and their adoption and diffusion throughout the world (Islam, 2018). Despite considerable uncertainty, there are still many estimates of the effects of the digital revolution on rising unemployment. Studies conducted in Finland, an economically viable economy, show that technological unemployment can be a threat, but

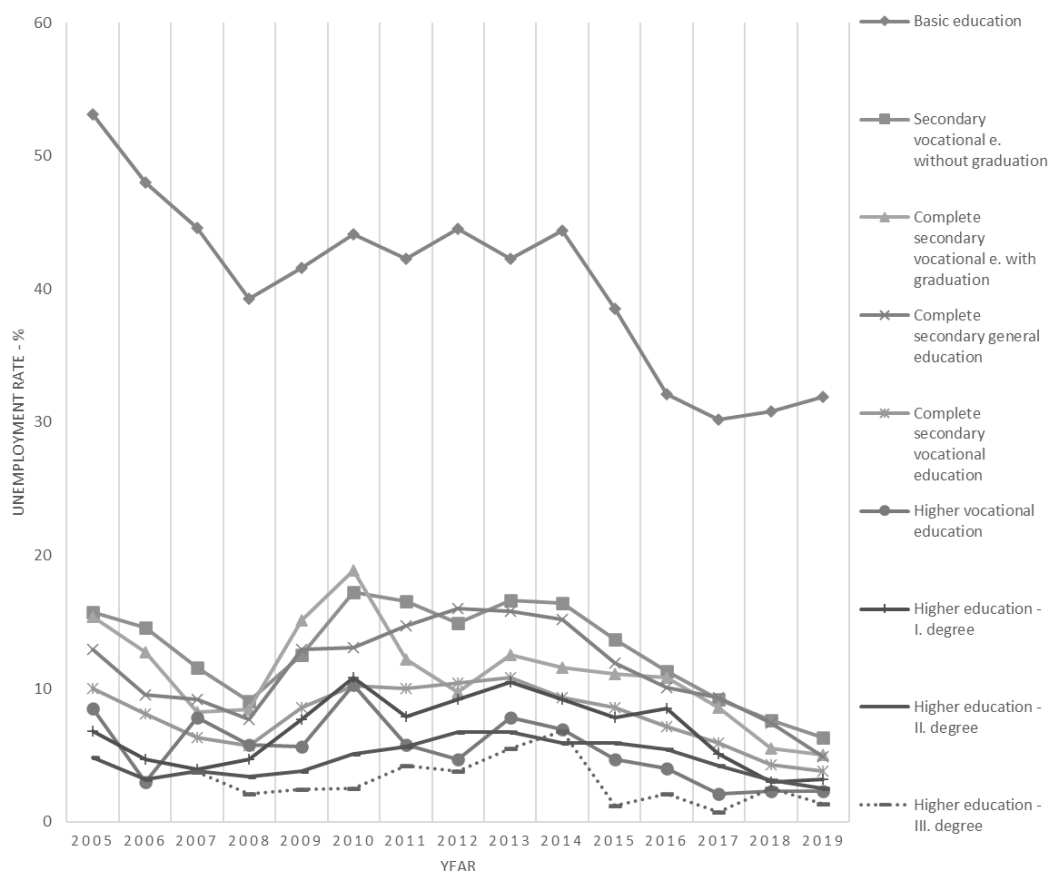
does not mean the "end" of work (Pulkka, 2019). New types of work will emerge, new jobs will be created, and even if the effects of the introduction of modern technologies in the growth of unemployment are felt, the whole problem can be solved through several measures. One of them is the concept of unconditional basic income or the possibility of reducing working hours. Thus, it will be necessary to change, supplement or create new laws that will regulate working conditions in this new way of functioning of economies. However, while the digital revolution does not seem to be such a major threat to developed countries, the position of developing countries on this issue is diametrically opposed. Their economies are mostly built on lower labor costs and many manufacturing companies are concentrated in them. These are, therefore, primarily jobs that are directly threatened by automation. However, some studies also refute this assumption, arguing that while the digital revolution will lead to the emergence of new professions, they may still be suitable for less skilled people (Ernst, Merola, Samaan, 2019). Of course, it will also be necessary for these people to go through training programs aimed at preparing them for the transfer to new jobs. Therefore, the goal for the future cannot just be to prepare new generations to work in a highly digitized environment. The aim must be for all citizens of each country, regardless of their level of education, age or current skills, to be able to acquire the necessary digital skills to enable them to find and keep a job in the new changed conditions. Governments around the world cannot ignore this fact, as the inadequate level of education of citizens is usually the reason for greater time delays in introducing the latest trends.

In addition, an inadequate level of education can trigger unemployment growth. Unemployment usually leads to a decline in economic activity and economic stagnation. As a result, the unemployment rate is popularly used as an indicator of whether a state's economy is doing well or not. The search for a dependence between the unemployment rate and the DESI index was also examined in a study which showed that European countries with higher unemployment rates generally show lower values of the index (Stavytskyy, Kharlamova, Stoica, 2019). Its conclusions show that in the

near future they could be able to increase the values of this index precisely due to falling unemployment, which is one of the basic macroeconomic goals for any economy. In this

context, it is necessary to point out the unemployment rate according to the highest level of education attained, even if education is not the only factor influencing it.

**Figure 3: Unemployment rate by educational attainment in Slovak republic**



Source: ŠÚSR, own processing

After evaluating the development of this unemployment rate in the Slovak Republic, we came to several conclusions. The above-mentioned graph draws particular attention to the high unemployment rate of the low-skilled workforce - people with basic education, which remains high in recent years, despite the positive development of the unemployment rate. Even while in 2005 it was only 3.28 times higher than the total unemployment rate in the Slovak Republic, in 2019 the unemployment rate of these persons was up to 4.67 times higher than

the total. The gap has clearly widened, proving that a workforce without any qualifications is becoming increasingly difficult to employ in the context of the rapid introduction of digital technologies. This group of people makes up a substantial part of the long-term unemployed, who are difficult to re-employ, as they have often lost their work habits. Not only in the Slovak Republic, but throughout the world, development trends in the market suggest that unskilled or low-skilled labor is increasingly being pushed out of the labor market.



Much lower unemployment was reported for people with any higher than basic education, but even here there are differences between different levels of education. It is interesting e.g. to monitor the difference between the unemployment rate of persons with upper secondary vocational education and upper secondary general education, from which it can be concluded that persons with vocational education are better placed on the labor market. The biggest difference can be seen in the post-crisis years, especially in 2014, when the unemployment rate of people with full secondary general education was 5.9 percentage points higher than the unemployment rate of people with full secondary vocational education.

Furthermore, the graph shows a difference in the employment of people with higher education I. and II. degree. For graduates of bachelor's degree programs who have decided not to continue their studies at II. degree, is often seen as less able (often assumed that they do not continue their studies because it was difficult for them, did not enjoy them, etc.) compared to graduates of master's and engineering programs, and therefore it is more difficult for them to find employment. . Companies prefer people with completed II. degree of higher education, although a bachelor's degree is sufficient for a number of job positions. The long-term lowest unemployment rate is reported for persons with university education III. degree. However, there are significantly fewer such graduates each year compared to graduates at other levels of the education system.

It is also important to note in the graph that, regardless of the level of education attained, the unemployment rate in the last 15 years has also been linked to economic developments. After a period of relatively favorable development, the unemployment rate in the Slovak Republic increased as a result of the economic crisis that erupted in 2008. The increase in the number of unemployed occurred not only among the low-skilled workforce, but also among people with a university degree. Increase in the unemployment rate for people with university education II. and III. however, it was insignificant compared to the growth of unemployment in the other monitored categories. It can therefore be assumed that, although there are opinions that the digital transformation will create enough opportunities for less skilled workers, recent trends will

continue and people with higher education will have a better chance of getting a job.

However, at the time of digitization, the risk of further widening income inequality appears to be at a much higher risk than the risk of losing a job, as companies that are able to adapt to the changes resulting from the implementation of state-of-the-art technologies are expected to move towards to gain market dominance. However, dealing with this issue is not the subject of this paper.

## Conclusion

The effects of the digital transformation of the economy are being felt in all areas of human life. In addition to the functioning of manufacturing companies, where human labor under the influence of automation is pushed by machines or robots with artificial intelligence, and changes in the labor market, ongoing processes also significantly affect education systems. Until recently, the insufficient quality of education systems was pointed out, especially in the conditions of developing countries. At a time when the knowledge economy is gaining in importance, their modernization and improvement is beginning to pay more and more attention even among developed countries. It turns out that many countries have not been able to respond to the changes that are taking place in society. At first, it seemed that there would be enough time to introduce gradual changes, but recent years have shown that the speed with which they are introduced is crucial. It must not be forgotten that the results of the changes will take effect with a certain delay. Despite the fact that the ongoing processes of digitization have been talked about for several years, the level of digital skills of Slovaks does not change significantly. Intelligent robots are expected to replace people in performing certain routine activities, so less demanding jobs will be lost. And while new ones will emerge, they will require new competencies from workers. It will thus be necessary to prepare potential employees for new, but also more and more complex jobs, without a certain level of digital skills. Developments in the past show that how people are able to enter the labor market is related to the

level of education achieved. It is almost certain that this will continue to be the case, notwithstanding the changes that are taking place on a permanent basis, although in the second half of the 20th century there were views that the impact of education on employment and the contribution of education to economic growth is steadily declining. . Of course, it cannot be ruled out that a certain part of the skills will be acquired by the worker directly in practice, nor can it be assumed that the workers with the greatest abilities are always the best paid and hold the highest positions. We have often

witnessed a situation where acquaintances, political influence or belonging to a certain privileged group have a far greater influence on the position a worker holds than education itself. Nevertheless, in most cases, adequate education is the decisive factor on which a person's ability to get a job, stay in place, but also his ability to adapt to constant change. This often results in his willingness to participate in the process of lifelong learning, which is just one of the prerequisites for employment in the digital economy.

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