

# DIGITAL TRANSFORMATION AND DIGITAL READINESS OF BUSINESSES IN SLOVAKIA AND THE EU

Erika Ľapinová

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## Abstract

Digitalization is one of the most actual trends in Slovakia and the EU, it affects the social and economic environment in many ways. Both Slovakia and Europe have set strategic goals in this area and tools to fulfill them. Looking at the results of measuring the level of digitization using the DESI index, Slovakia lags behind the European average in many aspects. We don't even have a lot of data on the real level of digitization of businesses and the needs in this area in Slovakia. Data are not monitored in official statistical surveys to the required extent. However, there are some surveys or examples of successful Slovak practice that monitor the level of digitization and digital transformation and from which the needs of companies in the subject area can also be identified. The aim of our contribution in the theoretical part is to summarize the basic principles of digitalization of businesses and their importance, clarify main EU and national strategic documents of digitalization. In the analytical part, we aim to bring information about the availability of data and present some key data importance of digitization for the businesses, about the threats and opportunities which digitalization brings for them.

**Keywords:** digitization and digital transformation of businesses, information and communication technologies

**JEL Code:** D2; O33

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## Introduction

The topic of digitization is a current economic-political, economic, and social topic, which is affecting the world of individuals, companies, the public sector, and public services, as well as EU initiatives. The significant macroeconomic and microeconomic dimension of the digitization issue is indisputable: on the labor market and workforce requirements (Luptáčik, M. et al., 2021 and others) and also on business processes and organization (we specify these changes below in the text). Digitization also places demands on the public sector, which acts both as an actor of state digital policies and as a provider of public services, such as education, healthcare and transport, research and development, in which digitization fundamentally

interferes. Digitalization activities and processes that provide data/information for improvement of organizational processes or information for self-governing decisions also take place in the local government environment. Whether it is the provision of transparent information, communication, and presentation toward citizens, or data that the local government needs in the context of provision public services, operational and strategic management and decision-making (sustainable and intelligent/smart governance).

In our contribution, we focus specifically on the business sector, for which digitization brings many challenges and opportunities. In the corporate sphere, digitalization is already fundamentally changing the nature of production processes at both strategic and operational levels (including demands on the workforce and changes in the nature of the work that the workforce performs) and brings results in the form of optimal use of the potential of the workforce and results in the form of efficiency optimization (performance), increasing the competitiveness and sustainability of enterprises. In this context, issues of government policies (both national and European) to support digitization and its tools are also relevant.

The aim of our contribution in the theoretical part is to summarize the basic principles of digitalization of businesses and their importance, clarify main EU and national strategic documents of digitalization. In the analytical part we aim to bring information about the availability of data and present some key data importance of digitization for the businesses, about the threats and opportunities which digitalization brings for them. We worked in the theoretical part with methods of systematization and critical analysis of selected scientific and professional sources on the issue, in the second part of our contribution we used methods of description and comparison of secondary data from public statistical databases and data from surveys in the business sphere.

## **1 Definition of concepts and strategic documents of the EU and the Slovak Republic in the field of digitization**

Industry 4.0<sup>1</sup> represents the intelligent networking of machines and processes in industry with the help of ICT. Firms use intelligent networking in many ways: flexible production, convertible factory (production lines can be built in modules and quickly assembled for tasks), customer-oriented solutions, optimized logistics, use of data, resource-efficient circular

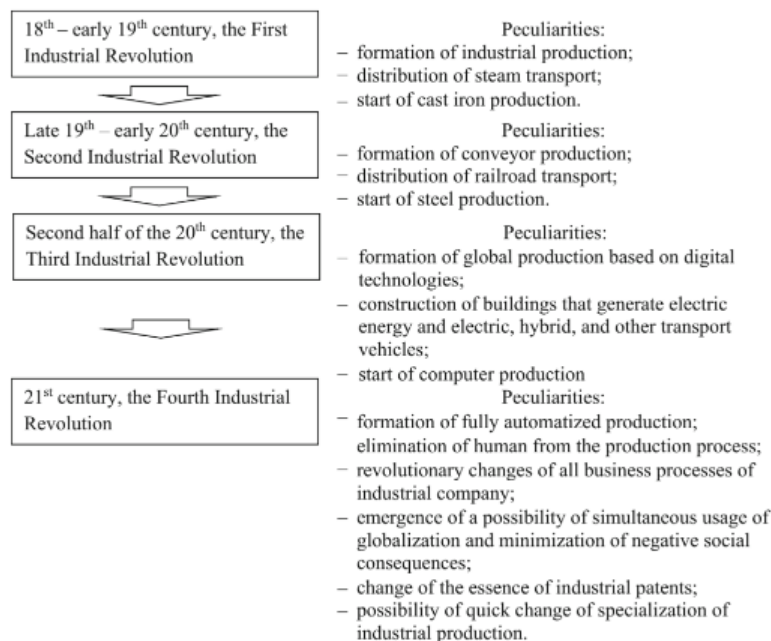
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<sup>1</sup> The term „Industry 4.0“ was introduced in Germany in 2011. Association of representatives from business, politics and academia promoted Industry 4.0 as an approach to strengthening the competitiveness of the manufacturing industry. The German federal government supported the idea Industry 4.0 as an integral part of its „High-Tech- Strategy 2020 for Germany“.

economy (Pascual, D. G. et al., 2020). Pascual et al. (2020) identified the following five main components of networked production: digital workpieces, intelligent machines (they communicate simultaneously with the production control systems; workpieces being processed, so that the machine coordinates, controls, and optimizes itself), vertical network connections, horizontal network connections (throughout the whole supply chain, between the suppliers, manufacturers, and service providers), smart workpieces.

Sensors, machines, workpieces and IT systems are connected (CPS) and can interact with one another using standard internet-based protocols. They can analyze data to predict failure, configure themselves, and adapt to changes. Industry 4.0, thanks to the possibility of collecting and analyzing data across machines, enables fatter, more flexible, and efficient processes to produce high-quality goods at reduced costs. This increases manufacturing productivity, shifts economics, fosters industrial growth, and modifies the profile of the workforce, ultimately changing the competitiveness of companies and regions. In Figure 1 below are all four stages of industrial revolution visualised according to Popkova et al. (2019).

**Fig. 1: Development of industrial production with revolutionary stages**



Source: Popkova, Ragulina, Bogoviz (2019)

Meindl et al. (2021) identified two main levels: the base technology level and the front-end technology level. Base technologies boost digital transformation in each enterprise dimension and differentiate what Industry 4.0 is regarding previous stages of industrial development. The front-end dimensions comprise the technologies of a smart enterprise's technologies for specific purposes within and beyond its frontiers. The internal dimensions

consider the value streams focused on the company's industrial activities: its production processes (Smart Manufacturing) and its workers (Smart Working). The external dimensions consider the value streams that integrate the company's processes with the external environment: its supply chain (Smart Supply Chain) and its customers (Smart Products and Services).

Informatization (electronization) is the process of penetration of information and communication technologies (ICT) into all areas of social, political, and economic life. Digitization – conversion of data and information into digital/digital expression (conversion of analog signal to digital/digital). To distinguish computerization/informatization from digitization: while informatization is the introduction of ICT into practice, digitization is the transfer of the content itself (data, information) to ICT. In a broader sense, digitalization means the implementation of digital technologies into practice (i.e. devices that collect and analyze data, monitor processes, simulate processes, and integrate multiple systems and technologies).

A systematic review of the implementation of industry 4.0 from the organisational perspective brought, for example, Nayernia et al. (2021). In their opinion: 'Despite the growing amount of published work covering a wide range of areas of I4.0, there has been relatively little research devoted to the organisational side of implementing I4.0'. The scientific and professional community in Slovakia and the world are looking for answers to the questions of why digitization is important in the corporate sector, what are its consequences and what are the prerequisites for the successful implementation of digital technologies (at the national and corporate level).

**Tab. 1: Driving forces and barriers to Industry 4.0 implementation by Vuksanović et al. (2020)**

<b>Driving Forces</b>	<b>Sources</b>
Competitiveness and business model innovation	Lasi et al. (2014); Rübmann et al. (2015); Burmeister et al. (2016); Arnold et al. (2018); Laudien and Daxböck (2017); Laudien et al. (2018); Ibarra et al. (2018); Ślusarczyk (2018)
Cost reduction and performance improvement	Rogers et al. (2013); Rogers and Trombley (2014); Brettel et al. (2014); Geissbauer et al. (2016); Schmidt et al. (2015); Rübmann et al. (2015); Erol et al. (2016); Stock and Seliger (2016); Oettmeier and Hofmann (2017); Müller et al. (2018)
Labor market changes	Bonekamp and Sure (2015); Kiel et al. (2017); Oettmeier and Hofmann (2017); Müller et al. (2018); Agolla (2018)
Customer needs	Spath et al. (accessed 2020); Seufert and Meier (2016)
<b>Barriers</b>	<b>Sources</b>
Financial issues	Herrmann et al. (2014); Rübmann et al. (2015); Kiel et al. (2017); Müller et al. (2018)
Organizational challenges (planning system, protocols, coordination)	Brettel et al. (2014); Arnold et al. (2018); Kiel et al. (2017); Basl (2017)
Managers' and employees' competences	Erol et al. (2016); Kiel et al. (2017); Basl (2017)
Resistance	Bauer et al. (2015); Kiel et al. (2017); Nagy et al. (2018)

Source: Vuksanović et al. (2020)

**Tab. 2: Driving forces and barriers to Industry 4.0 implementation by Horváth – Szabó, 2019**

Driving force	Sources	Barrier	Sources
<b>Growing competition</b>	Bauer et al.(2015); Lasi et al. (2014)	<b>Human resources and work circumstances</b>	Adolph et al (2014); Bauer et al. (2015); Erol et al. (2016); Karre et al. (2017); Kiel et al. (2017b); Müller and Voigt (2017); Shamim et al. (2016); Smit et al. (2016)
<b>Increased innovation capacity and productivity</b>	Bauer et al.(2015); Lasi et al. (2014); Paritala et al. (2016)	<b>Shortage of financial resources</b>	Erol et al. (2016); Kiel et al. (2017b); Müller and Voigt (2016); PwC (2014)
<b>Expectations of customers</b>	Adolph et al. (2014); BMBF (2014); Karre et al. (2017); Nagy (2019); Spath et al. (2013)	<b>Standardization problems</b>	Müller and Voigt (2016); Nagy (2019)
<b>Efforts to save energy and improve sustainability</b>	de Sousa Jabbour et al. (2018); Kovács (2017a); Lins and Oliveira (2017); Nagy (2019); Paritala et al. (2016); Szalavetz (2018)	<b>Concerns about cybersecurity and data ownership issues</b>	Cimini et al. (2017); Kiel et al. (2017b); McKinsey and Company (2016); Weber and Studer (2016)
<b>Financial and performance factors</b>	Kiel et al. (2017b); Losonci et al. (2019)	<b>Risk of fragility</b>	Kovács (2018)
<b>Support of management activities</b>	Cimini et al. (2017); Inezari and Gressel (2017); Szalavetz (2018); Uden and He (2017)	<b>Technological integration</b>	Kiel et al. (2017b); Sung (2018); Varghese and Tandur (2014); Zhou et al. (2015)
<b>Opportunity for business model innovation</b>	Frank et al. (2019); Kagermann et al. (2013); Müller et al. (2018); Prem (2015); Smit et al. (2016); Ustundag and Cevikcan (2017)	<b>Difficulty of coordination across organizational units</b>	McKinsey&Company (2016)
		<b>Lack of planning skills and activities</b>	Basl (2017); PwC (2014)
		<b>Organizational resistance</b>	Automation Alley (2017); Kiel et al. (2017b); von Leipzig et al. (2017); Vey et al. (2017)

Source: Horváth – Szabó (2019)

In Tables 1, 2 we presented an overview of the literature that maps these aspects of digitization. In chapters 2 and 3, which is dedicated to the Slovak business environment, we then bring knowledge and the risks and opportunities of digitization in Slovak enterprises from the point of view of companies themselves and from the point of view of experts, researchers, and economic policy makers.

The implementation of digital solutions in companies, in addition to the "traditional" benefits (above mentioned), also brings benefits within the framework of modern business management trends, such as sustainable, green, or circular economy (Antikainen, Uusitalo, Kivikytö-Reponen, 2018; Hedberg, Šipka,2020; Barteková, Börkey, 2022 and others).

## 2 Strategic documents of the EU and the Slovak Republic in the field of digitization and the level of digitization of businesses in Slovakia

The Digital Agenda for Europe 2020-2030 is the EU's current digital strategy. On 9 March 2021, the EU introduced the Digital Compass, in which it outlined four goals for 2030. In the case of businesses, the goal is for 75 % of companies to use cloud computing services, big data, and artificial intelligence, and more than 90 % of small and medium-sized businesses should reach at least a basic level of digital intensity, and the number of unicorns in the EU should double. The Digital Europe Program established by Regulation (EU) 2021/694 is an EU initiative that allocates €7.5 billion (2021-2027) to digital technology projects. The fund is aligned with other EU funds such as Horizon Europe, the Connecting Europe Facility for Digital Infrastructure, and the Recovery and Resilience Support Mechanism (Digital agenda for Europe). Available from: <https://www.europarl.europa.eu/factsheets/sk/sheet/64/digital-agenda-for-europe>).

The framework supraministerial government strategy of the Slovak Republic in the field of digitization is the Digital Transformation Strategy of the Slovak Republic until 2030. It is based on EU strategies, OECD, or UN recommendations and also follows on from the creation of the multiyear financial framework of the EU for the years 2021-2027. The country subsequently also adopted the Digital Transformation Action Plan of Slovakia for the years 2023–2026.<sup>2</sup>

**Tab. 3: Digital Decade key performance indicators for enterprises in %**

	Slovakia			EU		Digital Decade target by 2030	
	DESI 2023	DESI 2024	Annual progress	DESI 2024 (data 2023)	Annual progress	SK	EU
<b>SMEs with at least a basic dig. intensity</b>	43	42,2	-0,9	57,7	2,6	90	90
<b>Cloud</b>	30,8	30,2	-1	38,9	7	75	75
<b>Artificial Intelligence</b>	5,2	7	16	8	2,6	75	75
<b>Data analytics</b>	NA	30,2	NA	33,2	NA	75	75
<b>AI or Cloud or Data analytics</b>	NA	45,8	NA	54,6	NA		75
<b>Unicorns</b>		0		263		3	500

Source: Report on the State of the Digital Decade 2024. Annex-Short Country Report 2024. Slovakia.

<sup>2</sup> In May 2021, the government approved the Strategy and Action Plan to improve Slovakia's position in the DESI (Digital Economy and Society Index) until 2025 (following the results of Slovakia's testing in the area of meeting the goals of the EU's digital policies).

The DESI index (Digital Economy and Society Index) is a composite index that monitors digital performance and its development in EU states in four basic dimensions: 1. human capital, 2. digital infrastructure, 3. digitalization of enterprises and 4. Digital public services. DESI 2024 results are currently available (with data for 2023) (see Tab. 3). At the end of this paper, in the appendix, there are graphs showing detailed information about Slovakia's position using selected DESI indicators for the third pillar: digitization of businesses. In connection with the Tab. 3, which contains data for Slovakia and the EU average, in Figures 2 - 5 in the appendix we also provide a graphic comparison of Slovakia compared to other European countries in the selected individual parameters of the DESI index for the business sector.

Regarding official statistical surveys on digitization in Slovakia, especially in the case of the corporate sphere, no statistics on the level of enterprise digitization are officially tracked. The Statistical Office monitors the data on ICT in businesses and households, but is not a statistical database about digitization as such. However, there are scientific works on this topic or survey results that are available that were implemented by private entities engaged in consulting, support, or interest business associations (e. g., Analysis of the Impact of Digital Transformation on Entrepreneurs in the private and public sector by Republican Union of Employers, 2017).

Since 2017, Industry4UM has been conducting research on the digitization of businesses in Slovakia. Here are some facts from the last year survey (2023) (113 respondents/enterprises contains): According to the results of the survey, we can only talk about the slow penetration of the Industry 4.0 concept into enterprises. Today, 27 % of companies implement their application strategy, which represents only a slight increase compared to previous years (26 % in 2021, 23 % in 2022). Even if the dynamics of application progress is not sufficient, a positive finding is the continuous year-on-year decrease in the share of companies that have not yet applied Industry 4.0.

Of the companies that are already digitizing, the companies with a majority of Slovak capital lag significantly behind. Although their share is slowly increasing year-on-year, compared to companies with foreign capital (41 %) only half of them (20 %) are digitizing. Only 19 % of companies have free hands from the parent company to manage digitalization in their company, 58 % manage it partially, and in almost a quarter of companies (23 %) the digitalization strategy is determined by the parent company from abroad.

### **3 Causes of the current situation in the field of digitalization of the business sector in Slovakia and possible solutions**

The Slovak Republic's Ministry of Investments and Regional Development and Informatization had prepared a Report *containing recommendations on the design of grant schemes for the development and application of cutting-edge digital technologies. (2022)*. The report assesses the readiness of Slovakia, especially Slovak companies, for digital transformation in terms of prerequisites such as the regulatory environment, digital skills and education, connectivity and infrastructure, innovation ecosystem, investment and business environment in Slovakia (including a SWOT analysis of the readiness of the Slovak environment for digitization in various aspects). The report also maps the opinions of respondents from various target groups in terms of needs and barriers to digitization, including the opinions of the companies themselves.

The report states that the business sector in Slovakia has long lacked access to sufficient sources of repayable and non-repayable financial aid for investing in innovations and new technologies. The volume of risk capital, which is key and often the only one in the case of new technological solutions, is insufficient. The lack of financial resources in Slovak companies related to both external and internal sources of financing (undercapitalization of enterprises, especially enterprises with Slovak ownership and SMEs). Among experts, there is agreement on the need for support, especially in the area of introducing innovations to small and medium-sized enterprises companies, as it has also proven itself in other EU countries. However, in general, simplification and transparency of the support implementation system are seen as key determinants for the intensification of financial support for enterprises. Regarding the drawing from the Recovery and Resilience Plan of the Slovak Republic, according to the report, only approximately 2.65 % of the investments contributing to digitization are allocated from it for the purpose of digitizing businesses, the report states (the data show that 'Slovak companies are able to draw financial resources for support innovations', which is stated in the above-mentioned report of the Ministry of Investments, Regional Development and Informatization of the Slovak Republic for the EU).

As part of the overall assessment of Slovakia's readiness for digital transformation, the report notes a low rate of investment in research and development in Slovakia. Overall, to increase innovation potential and improve performance, functional innovation ecosystems also play a key role, creating the foundations of cooperation within the triple-helix or quadruple-helix models of partnerships (private, academic and public sector or civil). Building functional



platforms for communication and cooperation will allow us to effectively concentrate the best innovative capacities of individual sectors, which represents a significant step forward. The knowledge obtained from the focus groups (for the purposes of preparing the aforementioned report) speaks of the dysfunctionality of this system caused by the absence of support and long-term vision from the state.

Subsequently, the report defines the key priorities of digital transformation in Slovakia according to individual strategies and concepts, including the priorities for financing from the Slovakia 2021-2027 Program or the Slovak Republic Recovery and Resilience Plan. The report also contains detailed proposals for implementation measures to support digital transformation, including state aid instruments, both of nonfinancial and financial nature.<sup>3</sup>

According to the representatives of business sector, it is generally considered the biggest priority to ensure sufficient non-returnable resources for the innovative activity of enterprises. According to the respondents, support should also aim at introducing existing innovations into SMEs and in its own research and development in cooperation with partners. Other priorities are the creation, prototyping, and scaling of innovations and the development of specific digital skills. Specifically, startups identified as a priority the support of existing innovation groups, hubs, incubators, and accelerators.

From the public sector, companies expect the provision of quality electronic services, the implementation of systemic changes in formal education, and the construction of network infrastructure. The priority of the academic sector as part of the digital transformation process should be primarily to ensure sufficient talent for the labor market within education. In the framework of education and research, it is also necessary to develop cooperation with the private sector in the creation and testing of innovations or the implementation of research and development projects.

The most suitable forms of financial support for digital transformation are identified by companies as grants, subsidies, and tax breaks. Respondents criticized the current support system, the administrative burden, which they do not have the capacity or finances to handle, the transparency and expertise of the project assessment within the entire process of obtaining

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<sup>3</sup> 1. repayable resources (financial instruments - loans, guarantees, direct investments of venture capital, investments through financial intermediaries); 2. grants (demand-oriented projects on the basis of de minimis schemes or state aid schemes); 3. cascade financing; 4. indirect support (providing consultancy); 5. vouchers; 6. investments from directly managed programs (e.g. Digital Europe, Horizon Europe); 7. investment platforms, 8. scholarships, 9. incentives for angel investors, 10. tax breaks (the Report clearly shows the possibilities of using these tools by individual types of subjects)

support. Additionally, companies also see a lack of connection and cooperation between individual sectors.

According to *Industry4UMs Surveys of Industry 4.0 in the Slovak Republic (2017-2023)*: The main reasons why companies approach digital transformation are increasing the efficiency of production processes, maintaining competitiveness, and better use of data. In internal processes, companies see the greatest need to apply Industry 4.0 in production, logistics, and preproduction phases. In external processes in cooperation with customers and buyers, in communication with the supply chain, and with external logistics. The biggest obstacles that limit companies in digitization are the investment complexity of the offered solutions (59 %), insufficient skills of employees (44 %), but also the fact that TOP management does not consider Industry 4.0 as their priority (31 %).

A long-term problem businesses face is the lack of skilled workers. The absence of skills corresponding to the needs of practice is most felt in the field of programming and management of software applications (41 %), data analysis (36 %), and industrial engineering (35 %). For 56 % of companies, the motivation to start or intensify digital transformation would be examples of the successful application of Industry 4.0 by other companies, and with the same share and higher financial support for the development of Industry 4.0, they would also be encouraged by more information (38 %). According to the findings, the availability and quality of information on digital transformation and Industry 4.0 is increasing. Today, a third of businesses confirm that they have enough of the necessary information. However, a relatively high proportion of companies (51 %) still lack essential and important information for their next move. Companies search for information primarily in professional media and on web portals (53 %), obtain it from internal specialists (43 %), at conferences and workshops (41 %), or get it from external consultants (39 %).

## Conclusions

In conclusion, we can state that the aim of our contribution has been fulfilled: we summarized the basic principles of digitalization of businesses and their importance, clarified main EU and national strategic documents of digitalization. We brought information on the availability of data and present some key data importance of digitization for businesses, on its threats and opportunities.

The national states or the EU are key actors in this process. It will depend on the strategic and conceptual setting at these levels. However, these entities are not, and cannot be, the only

actors. Business sector – individual businesses, associations of businesses, various business platforms and initiatives, consulting, advisory, scientific, and research institutions that operate in the business space, and the activity and motivation to act in the case of all these business entities, including companies that provide them with services (consulting, service, ICT, research) are equally crucial.

As can be seen from the above-mentioned data (DESI, the findings of the Statistical Office of the Slovak Republic, researches in Slovak enterprises) and from the "voices" sounding from the representatives of business practice themselves, Slovakia lags behind in the level of digitization compared to the European average. Not only in the business sphere, but also in the public sphere or the level of digital skills of the population, education for "digital practice" or digital infrastructure.

Opportunities of Industry 4.0 for businesses are unbreakable: thanks to the possibility to gather and analyze data across machines, Industry 4.0 is fatter, more flexible, and efficient processes to produce high-quality goods at reduced costs. This increases manufacturing productivity, shifts economics, fosters industrial growth, and modifies the profile of the workforce, essentially changing the competitiveness of companies and regions. Among the modern concepts of business management, the implementation of which digitization enables and supports, we mention the circular economy as an example, sustainability and ecological targets of modern business management. Obstacles of digitalization in businesses consist in: insufficient financial resources, insufficiently prepared human capacities, insufficient support from the state, lack of information (both theoretical and applied) about the potential of digitization for business practice and also security context of digitalization.

Due to the fact that we do not have much information on the issue from publicly available officially maintained databases of statistical data, we draw from existing surveys and reports prepared by independent private entities that cooperate with companies in the given area (e.g. Industry4um - consultancy, information, education, etc.) or from studies of representatives of business entities (Republican Union of Employers) developed with the aim of improving the undesirable situation and solving the problems of businesses related to digitalization. We also bring to your attention a report prepared about Slovakia for the European Commission in terms of support for implementation of reforms and investments under the Recovery and Resilience Plan in the year 2022.

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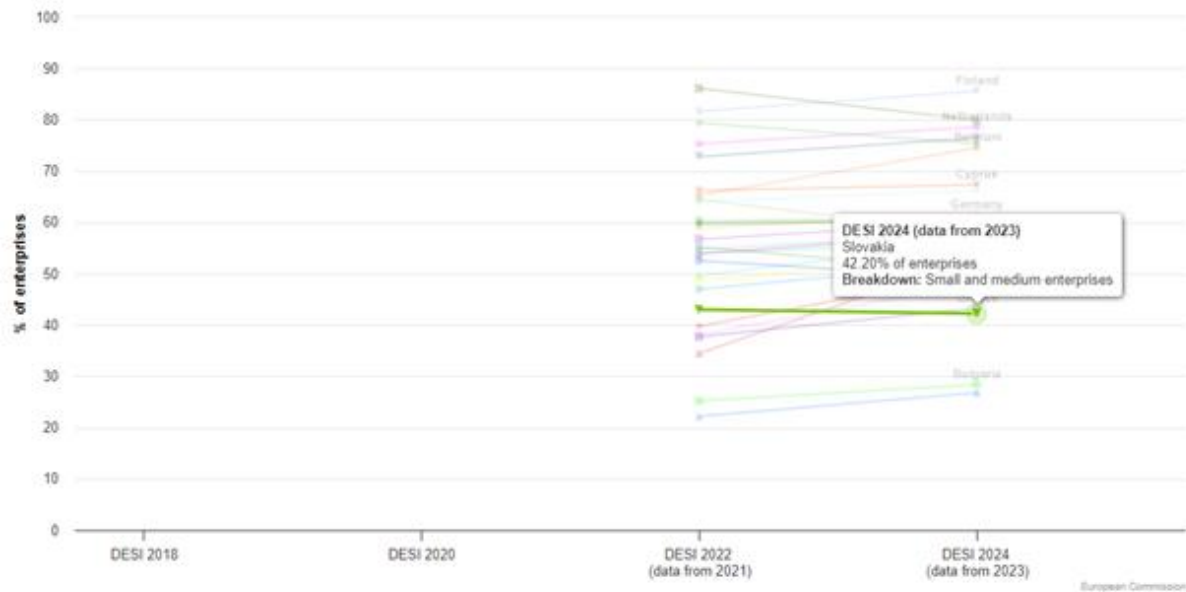
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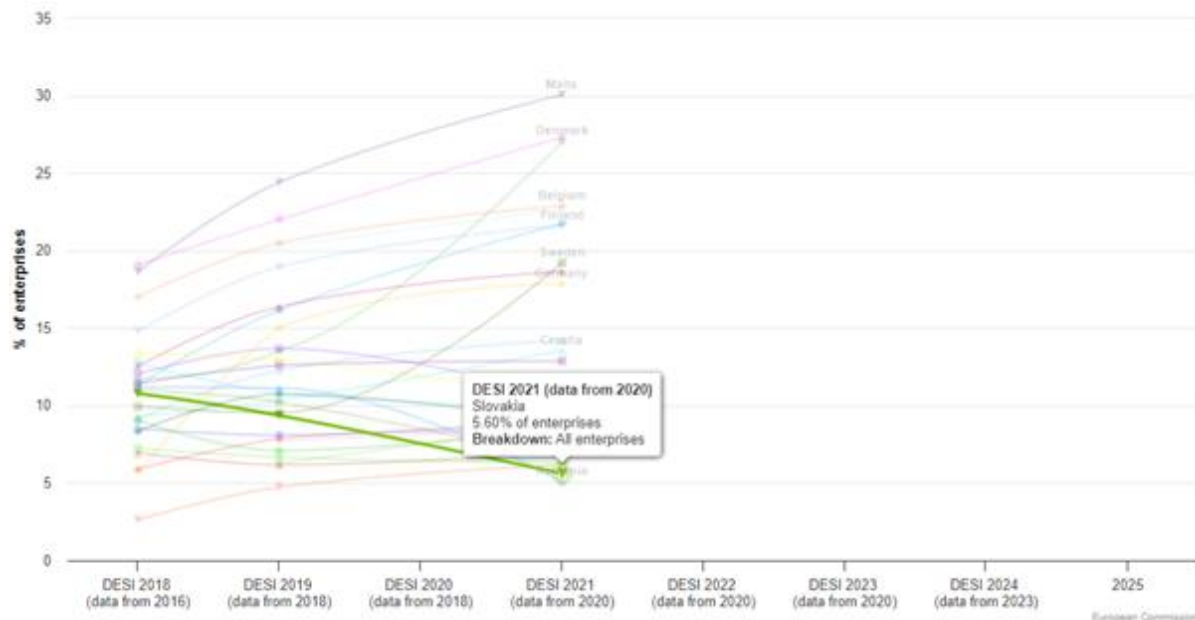
## Appendix

**Fig. 2: SMEs with at least a basic level of digital intensity (DII v3, available years: 2021 and 2023), Small and medium enterprises (10-249 persons employed)**



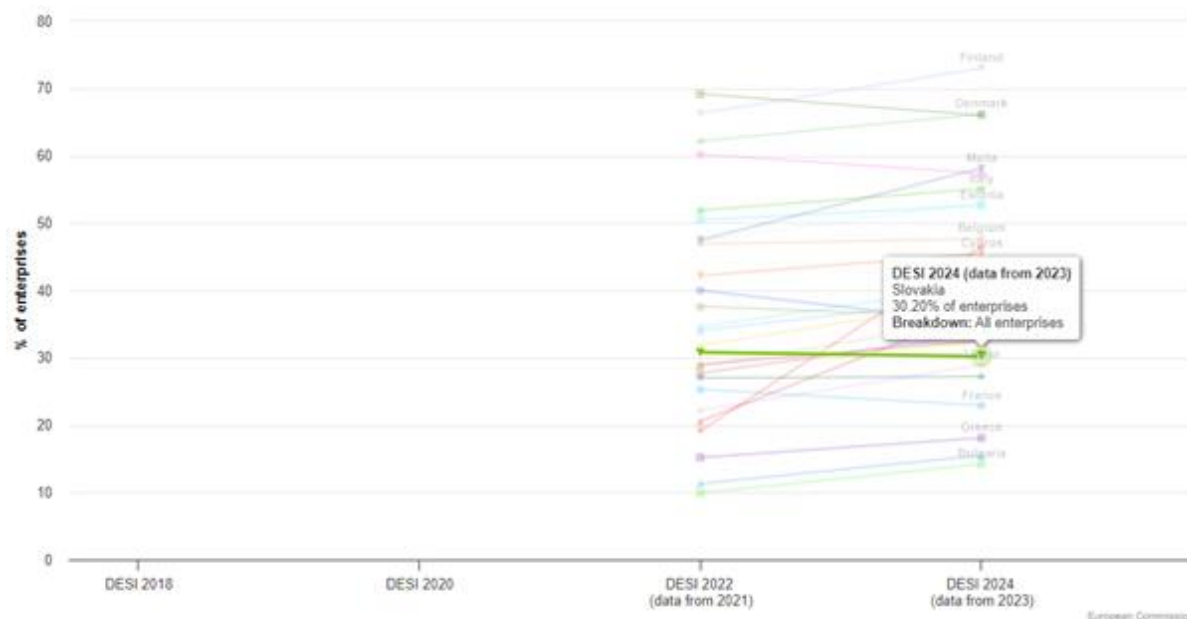
Source: European Commission. Digital Decade DESI visualisation tool. Available at: [https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi\\_sme\\_di3\\_gelo&breakdown=ent\\_sm\\_xfin&unit=pc\\_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE](https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi_sme_di3_gelo&breakdown=ent_sm_xfin&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE)

**Fig. 3: Big data, All enterprises (10 persons employed or more)**



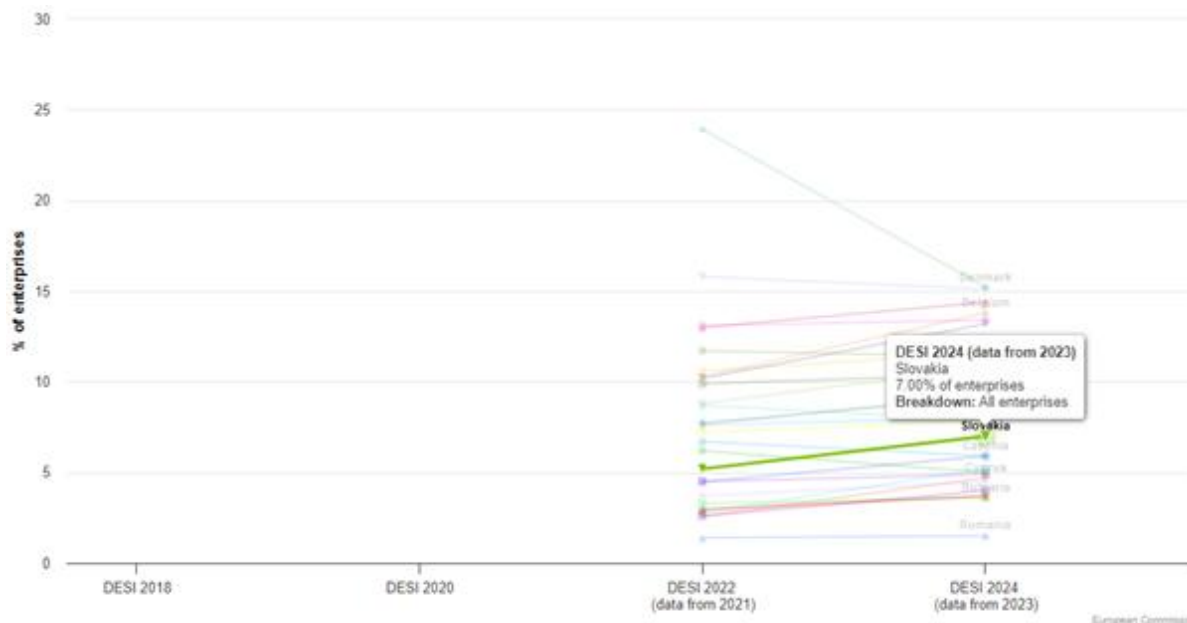
Source: European Commission. Digital Decade DESI visualisation tool. Available at: [https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi\\_bigdata&breakdown=ent\\_all\\_xfin&unit=pc\\_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE](https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi_bigdata&breakdown=ent_all_xfin&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE)

Fig. 4: Cloud, All enterprises (10 persons employed or more)



Source: European Commission. Digital Decade DESI visualisation tool. Available at: [https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi\\_cloud&breakdown=ent\\_all\\_xfin&unit=pc\\_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE](https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi_cloud&breakdown=ent_all_xfin&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE)

Fig. 5: Artificial intelligence, All enterprises (10 persons employed or more)



Source: European Commission. Digital Decade DESI visualisation tool. Available at: [https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi\\_ai&breakdown=ent\\_all\\_xfin&unit=pc\\_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE](https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/compare-countries-progress?indicator=desi_ai&breakdown=ent_all_xfin&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE)

**Contact**

Erika Lapinová

Matej Bel University in Banská Bystrica, Faculty of Economics

Tajovského 10, Banská Bystrica

erika.lapinova@umb.sk