

# MONITORING PROGRESS IN NATIONAL INITIATIVES ON DIGITISING INDUSTRY

Country report

*Slovakia*

*July 2019*



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## Summary

Slovakia belongs to the group of lower performing countries among the EU Member States concerning digitalisation. On the Digital Economy and Society Index (DESI), Slovakia ranks 20<sup>th</sup> in 2018, the same rank as in 2017, however, with an improved score. Slovakia significantly underperforms in terms of connectivity and digital public services and achieves average results in human capital, use of internet and integration of digital technology.

The Slovak economic growth has been steady over the past years accompanied by improvement in employment rates. At the same time, the supply of skilled workers, particularly Information and Communication Technologies (ICT) specialists has been decreasing, creating a shortage in this respect.

To support industries in their digitalisation efforts and create better conditions to further capitalise on these, Slovakia launched the Smart Industry for Slovakia strategy in 2016 and established working groups in relevant areas. In March 2017, the platform held its first meeting, involving representatives of the government, businesses and academia. In 2018, the Action Plan was approved containing 35 measures, which should be realised by the end of 2020. The measures will draw on a combination of European and national as well as private financial means.

In general, businesses feel lack of support in the process of digitalisation coming from public institutions and the regulatory framework is not adapted to the process of digitalisation yet, containing definitions that do not fit the latest digital developments.

A considerable number of initiatives tackling the process of digitalisation come from private businesses and business associations. They fall under the pillars 3 and 5 of the Digitising European Industry initiative (DEI). There is cross-border cooperation with other EU Members States particularly those neighbouring Slovakia in the North and West but none of these focuses solely on digitalisation of industry. Currently, there are no Digital Innovation Hubs in Slovakia, however, three entities are receiving mentoring and coaching support in this area through an EU project. Regarding the regulatory framework (pillar 4 of the DEI), the Act on Cyber Security was adopted in 2018. Since 2008, the Computer Security Incident Response Team was established, firstly focused solely on public administration but whose competence has been widening throughout the years. Additionally, there is a number of support measures to provide additional incentives for research and development (R&D), such as vouchers, start-up support or innovation funds. It is foreseen that between 2017 and 2023 at least EUR 7.6 million will be spent on support vouchers.

Several initiatives in Slovakia address the cooperation between businesses and developing skills for the digital age (pillar 5 of the DEI). The public sector has mostly been active in building the necessary capacity for digital age in terms of human resources. For instance, the Ministry of Education, Science, Research and Sport works together with private entities to produce programmes developing digital skills. An example of such a project is the Learning for the 21<sup>st</sup> century project launched in 2016, which supports the development of IT sector in the education system that is foreseen to utilise EUR 17.8 million by end of 2020 from ESF and ERDF. Two more initiatives identified with regards to developing digital skills, Dual education and the Digital Coalition, were launched by a business association and a State Institute for Vocational Training. The Dual education project, funded also under ESF and ERDF, will receive EUR 33.6 million by its end in 2020.

Table 1 presents an overview of the main initiatives identified, that will be further detailed in this report. Table 2 presents a short SWOT analysis of Slovakia on digitalisation.

**Table 1: Overview of initiatives**

| Initiatives  | Starting year              | Overall strategy/DEI Pillar/support mechanism | Type of initiative        | Sectors targeted                           | Digital technologies targeted | Size of companies targeted | Budget  |
|--|----------------------------|---|---------------------------|--|-------------------------------|----------------------------|---|
| Smart Industry for Slovakia / Industry 4.0           | 2016                       | General Strategy                              | General Strategy          | Industry                                   | All                           | All                        | Structural Funds – no specific budget   |
| Industry 4UM   | 2017                       | Pillar 3                                      | Digital platform          | Industry                                   | All                           | All                        | Private funding   |
| Spolupracuj.me                                       | 2018                       | Pillar 3                                      | Digital platform          | Industry                                   | All                           | All                        | Private funding   |
| Act on Cyber security and amendments to certain laws | 2018 (implementation 2019) | Pillar 4                                      | Cyber security regulation | All  | Cyber security                | All                        | No specific budget  |
| Computer Security Incident Response Team             | 2008                       | Pillar 4                                      | Cyber security measure    | Public administration                      | Cyber security                | All                        | Unknown budget  |
| Dual education                                       | 2016                       | Pillar 5                                      | Platform                  | Industry and vocational training           | All                           | All                        | EUR 33,626,257.73, financed by the Operational Programme Human Resources (ESF and ERDF) |
| Digital coalition                                    | 2017                       | Pillar 5                                      | National Coalition        | Vocational training and private businesses | All                           | All                        | N/A   |
| Learning for the 21 <sup>st</sup> century            | 2017                       | Pillar 5                                      | Training                  | IT   | All                           | All                        | EUR 17.8 million - ESF and ERDF   |
| SME vouchers   | 2013                       | Support mechanism                             | Innovative voucher        | All  | All                           | SME                        | EUR 125,000 (2018)  |
| SIEA vouchers  | 2018                       | Support mechanism                             | Innovative voucher        | Creative industries                        | All                           | SME                        | EUR 7.6 million (2017 – 2023)   |
| Start-up support                                     | 2014                       | Support mechanism                             | Start-up support          | All  | All                           | SME                        | Unknown budget  |
| National holding fund                                | 1994                       | Support mechanism                             | Financial support         | All  | All                           | SME                        | Unknown budget  |

| Initiatives               | Starting year | Overall strategy/DEI Pillar/support mechanism | Type of initiative | Sectors targeted | Digital technologies targeted | Size of companies targeted | Budget         |
|---------------------------|---------------|---|--------------------|------------------|-------------------------------|----------------------------|----------------|
| Innovation fund           | 2016          | Support mechanism                             | Financial support  | All              | All                           | SME                        | Unknown budget |
| Slovak Investment Holding | 2014          | Support mechanism                             | Financial support  | All              | All                           | All                        | Unknown budget |

**Table 2: SWOT of the country on digitalisation**

|  |   |
|--|---|
| <p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>• Leading economy in Europe in terms of robotic intensity</li> <li>• Above average ultrafast broadband coverage</li> <li>• Positive economic outlook</li> <li>• High level of industrialisation</li> <li>• High foreign direct investment</li> </ul>   | <p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>• Low or no participation in competence centres and DIHs funded by EU projects</li> <li>• No presence of co-location centres</li> <li>• Lack of skilled employees in the labour market</li> <li>• Lack of national regulatory framework regarding digitising</li> <li>• Shortages of digital skills in public administration and the business sector</li> <li>• High financial burden connected to the introduction of new technologies to production</li> </ul> |
| <p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>• Continuous investments in academic research</li> <li>• Recent increase of digitising initiatives</li> <li>• Positive economic development and attraction of new investments in industry</li> <li>• Progress on eGovernment</li> <li>• Despite lack of digital skills, Slovaks are active internet users</li> </ul> | <p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>• No update of the regulatory framework making it incompatible for the digital age</li> <li>• Slovak economy is very dependent on car manufacturing industry, which is vulnerable to digital changes.</li> <li>• Low number of graduates in science and technology</li> <li>• Continuous brain-drain of labour force</li> <li>• The results of academic research cannot be used by private companies</li> <li>• Low supply of ICT specialists</li> </ul>            |

# 1 General context

The objective of this report is to analyse the current status of national initiatives on digitising industry in Slovakia. The analysis has been conducted against the background of the Digitising European Industry (DEI), which was the first industry-focused initiative of the Digital Single Market launched by the European Commission in 2016.

Similar country reports will be produced for each of the 28 EU Member States. These national reports allow to:

- Monitor the development of national initiatives on digitising industry;
- Compare different national approaches; and
- Identify best practices of national initiatives.

Monitoring and reporting back on the development of the existing national initiatives is an important element of the DEI initiative, and this report should be seen as one part of it.

For more details about the DEI and our methodological approach for the country report, please consult the document attached.

## 1.1 Economic context and status on digitisation

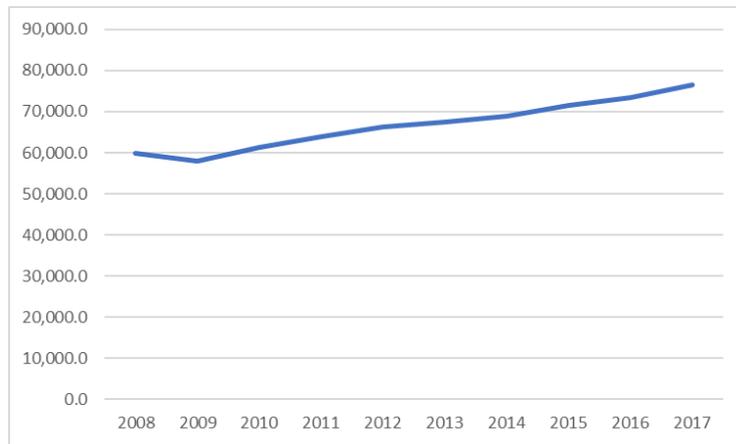
### *General economic context*

Slovakia possesses an economy with high stocks of foreign direct investments (FDI). The economic growth has remained solid in recent years, with substantial improvement of employment rates. In 2017, the gross domestic product (GDP) grew at 3.4% and is expected to continue growing in 2019. This boost has been enhanced by rising household spending, employment, increase in real wages, low credit costs and upbeat consumer sentiment. Overall, the economic growth is expected to remain well above the EU average. Similarly, Slovakia will enjoy steady net flows of FDI, increase in nominal wage growth and strengthening net trade.<sup>1</sup>

However, the positive outline is susceptible to a shrinking supply of skilled workers even coupled with a rising demand for labour. Moreover, Slovakia faces big regional disparities between regions, with the real GDP per person being more than three times higher in the Bratislava region than in the eastern one in 2015. This leads to the central and eastern regions lagging behind. These regions also face weaker human capital and inadequate or missing transport infrastructure.<sup>2</sup>

Slovakia's most important manufacturing and industrial sector is the automotive industry, accounting for 44% of the country's total industrial production. Slovakia belongs to the 20 biggest car producers in the world, producing more than one million cars per year. This production has been growing steadily in the past 10 years and is expected to reach 1.35 million produced cars in 2020.<sup>3</sup> This growth has been also reflected in steadily growing gross value added (GVA) in manufacturing, reaching EUR 76.43 billion in 2017 as presented in the figure below.

**Figure 1: GVA in manufacturing growth 2008-2017 in million EUR**

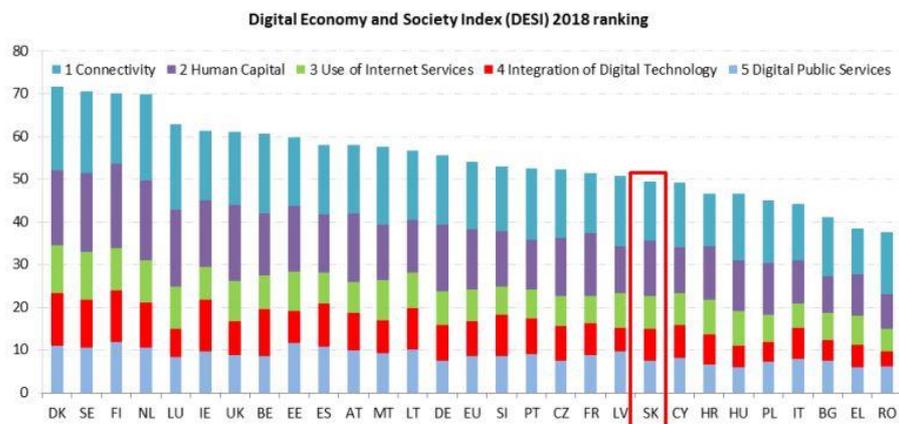


Source: Eurostat

### Status of digitisation

In 2018, Slovakia ranked 20<sup>th</sup> in the European Commission’s Digital Economy and Society Index (DESI) with a higher score (54) compared to previous years (50.8 in 2017).

**Figure 2: Digital Economy and Society Index**

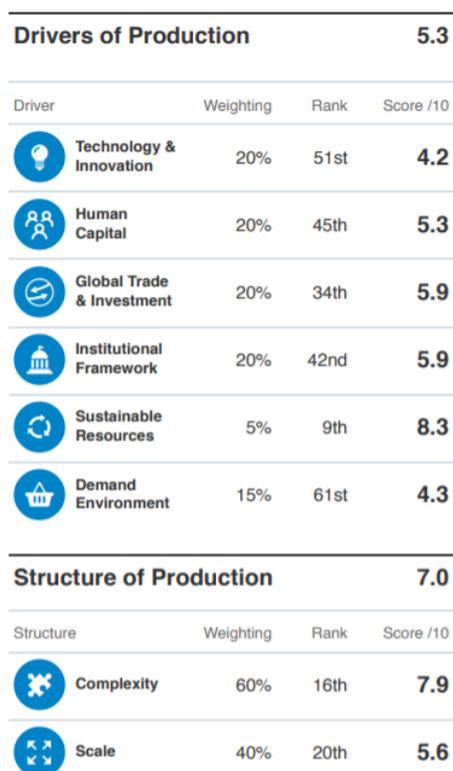


Source: Digital Transformation Scoreboard 2018

Slovaks are average internet users and the availability of broadband and 4G services are not as widespread as the EU average, covering 89% households (compared to the EU average of 97%). However, Slovakia’s ultrafast broadband coverage is above the EU average. Regarding human capital, Slovakia lacks the supply of ICT specialists despite the growing demand. Seventy-nine percent of Slovak population were internet users in 2017 and 59% of Slovaks have basic digital skills, both figures coming below the EU average. Nonetheless, public and private initiatives have been set up to improve the necessary capacity. Despite this lack of skills, Slovaks are active internet users: 63% use eBanking and 70% use online shopping services. In recent years, Slovakia has also made progress in digital public services and the country is taking steps towards modernising its public administration.<sup>4</sup>

As regards Slovakia's readiness for future production, the assessment carried out by the World Economic Forum in 2018 scores Slovakia with 5.3 out of 10 for drivers of production and 7.0 out of 10 for the structure of production.<sup>5</sup> A breakdown of drivers is provided in the figure below:

**Figure 3: Slovakia's readiness for future production**



Source: World Economic Forum, Readiness for the Future Production Report 2018

The table below summarises some of the economic and digital indicators for Slovakia.

**Table 3: General economic and digital indicators for Slovakia**

|          | % GDP from manufacturing | % increase GDP growth | DESI position – and change   | DESI sub-indicators Human Capital, Use of Internet, Integration of Digital Technology in 2018   |
|----------|--------------------------|-----------------------|--|---|
| Slovakia | 26.6 (2017)              | 3.22 (2016-2017)      | 20 <sup>th</sup> place (2018), same as in 2017 but with higher overall score, and higher than in previous years (21 <sup>st</sup> in 2016 and 2015). | <ul style="list-style-type: none"> <li>Human Capital: 16<sup>th</sup> (15<sup>th</sup> in 2017)</li> <li>Use of Internet Services: 16<sup>th</sup> (15<sup>th</sup> in 2017)</li> <li>Integration of Digital Technology: 18<sup>th</sup> (21<sup>st</sup> in 2017)</li> </ul> |

## 1.2 National strategy on digitising industry

The table below presents the main national strategy on digitising industry.

**Table 4: National strategy on digitising industry**

|  |  |
|--|--|
| Name   | Smart Industry for Slovakia, Industry 4.0  |
| Type   | National Strategy and Action Plan  |
| Starting date  | 2016 – National Strategy; 2018 – Action Plan   |
| Objective  | The objective is to raise public awareness about the necessity of taking concrete steps that would help to maintain the position of Slovak businesses on the industrial map of Europe. It targets industrial businesses, both SMEs and large enterprises. To this end, an Action Plan was developed with specific measures to contribute to the achievement of the objective.  |
| Ministry/ministries in charge (website, contact person)  | Ministry of Economy<br><a href="https://www.mhsr.sk/inovacie/strategie-a-politiky/smart-industry">https://www.mhsr.sk/inovacie/strategie-a-politiky/smart-industry</a>   |
| Scope of the strategy/action plan  | The strategy focuses on industry in general, mainly to increase awareness of the topic. It is foreseen that with the development of the industry, focus would shift onto specific sectors.   |
| Measures included in the strategy/action plan  | The action plan contains in total 35 measures. The measures aim at supporting industry businesses, businesses specialised in services regardless of their size to create better conditions for the implementation of the ongoing digitalisation, innovation and increasing their competitiveness. The measures are divided into five categories: <ul style="list-style-type: none"> <li>• Research, development and innovation;</li> <li>• Basic principles of IT security for implementing smart industry;</li> <li>• Labour market and education;</li> <li>• Reference architecture, standardisation and creation of technical standards, general European and national legal conditions;</li> <li>• Information and promotion.</li> </ul> |
| Overall funding and distribution by volume and source of funding (public/private, EU/national) | There is no specific budget assigned to the strategy. The measures introduced in the action plan will be financed either through the European Structural and Investment Fund (ESIF) or national budget. Two of the Labour Market and Education measures will be funded through the national programme Increasing the Innovative Performance of the Slovak Economy (ZIVSE) that counts with co-financing from the private sector. Some of the measures do not require any funding as they are mostly activating measures or measures targeted at legislative reform.  |

### **Impacts, challenges and perceptions**

In October 2016, the Slovak government approved the Conception of Smart Industry for Slovakia (also referred to as Industry 4.0) and established a platform of smart industry with working groups in relevant areas. The Strategy highlighted the strengths and weaknesses of the Slovak industry in the area of digitalisation to which the platform was to come up with solution strategies. It also further built upon the Strategy for Smart Specialisation of the Slovak Republic (RIS3)<sup>6</sup>, particularly in the area of R&D, whose main priority areas are:

- Increasing embeddedness of key industries in Slovakia;
- Support to economic growth through science, research and development;
- Creation of dynamic, open and inclusive innovative society;
- Improvement of quality of human resources for innovative Slovakia.

In March 2017, the smart industry platform held its first meeting, involving 30 representatives of the government, state administration, businesses, experts and academia.<sup>7</sup> In 2018, the Action Plan was approved containing 35 measures, which should be realised by the end of 2020. The action plan was approved one year later than initially planned as there were a number of consultation rounds to ensure that all the introduced measures would provide the largest benefit possible.<sup>8</sup>

Furthermore, the Office of the Deputy Prime Minister for Investment and Informatisation (ÚPPVII) has, in December 2018, presented a Digital Transformation Strategy of the Slovak Republic 2019-2030<sup>9</sup>. The strategy, currently being revised following a consultation process, will aim to accelerate the ongoing digital transformation processes in terms of building the digital market and carrying out various measures that are arising from cross-sectoral policies of the EU. Particular emphasis will be put on new digital technologies such as artificial intelligence, Internet of Things, 5G technology, big data and analytical processing of data, blockchain or high-performance computers, that have the potential to become a new engine of economic growth and competitiveness. To facilitate the adoption of the strategy a new unit "Laboratory of better services of digital technologies" will be created within ÚPPVII to assist in testing agile approaches to governance and policy-making.<sup>10</sup>

The strategy is accompanied by Action Plan of digital transformation 2019 - 2022<sup>11</sup> that focuses on measure in the following three areas:

- Improvement of education with focus on digital skills and employment for the modern era;
- Strengthening of pillars for a modern digital economy; and
- Ability of the public sector to use innovations and data.<sup>12</sup>

### 1.3 EU cooperation in the field of digitising industry initiatives

When preparing the national strategy, the Slovak government conferred with their counter parts in Austria, Czech Republic and Germany to gather their experiences on this topic. While currently there is no official cooperation focusing solely on the area of digitalisation of industry, the Slovak national authority does not eliminate this possibility.

Regarding EU cooperation in the field of digitising industry, the Slovak government and the ministries are participating in a number of activities organised by the European Commission, such as the EU Industry 4.0 where representatives of states and digital platforms may exchange experiences, Digital Industry Round Tables, European Stakeholder Forums, Digital Innovation Hubs or the Digitising European Industry initiative. Slovakia also participates in the Coordinated Plan on Artificial Intelligence, the Electronic Components and Systems for European Leadership (ECSEL) Joint Undertaking and is one of the founding countries of the European Blockchain Partnership.

Furthermore, Slovakia took part in the Smart Factories in new EU Member States<sup>13</sup> project managed by the European Commission for the European Parliament with the aim to implement a network of Digital Innovation Hubs (DIH) across 13 new EU Member States. The following three entities received mentoring and coaching activities:

- University Technology Incubator in Bratislava;
- Zilina Innovation & Technology Hub (ZINTECH);
- Institute of Technology "Jozef Murgaš" (IT-JM) in Presov.

On a more streamlined level, the following cooperation are formalised:

### ***Austerlitz Declaration***

In 2015, the representatives of Austria and the Czech and Slovak Republics signed a declaration on reinforcing cooperation in cross-border ties as well as support of economic growth and employment and other national and European policies.<sup>14</sup> Action plans are produced for each year, with Industry 4.0 being one of the mentioned topics. The group meets twice per year to exchange experiences and good practices in a number of areas.

### ***Visegrad 4 cooperation***

Slovakia is involved in close cross-border collaboration with the other Visegrad countries (the Czech Republic, Hungary, Poland and Slovakia). The Visegrad 4 cooperation builds on a joint declaration on the Future of Economic operation called the BUDAPEST Declaration, that encourages close cooperation of Industry 4.0 Technology Platforms. The aim is to strengthen cooperation within Central Europe, therefore, a common approach to industry 4.0 might be developed in the future.

### ***Innovation Diplomacy***

In November 2018 the Slovak government has approved the Innovation diplomacy scheme. As part of the scheme, Slovakia will have four innovation diplomats in three countries outside EU (China, USA and Israel) and one EU Member State – Finland as of June 2019. The main role of the innovation diplomat will be to help Slovak research institutions and businessmen in creating new cooperation with the innovation environment abroad, gather good practices and provide information about the Slovak innovation environment.<sup>15</sup> The scheme will be monitored and if deemed useful it will be extended to other countries, for example, South Korea.

## **2 Other policy support to digitising industry**

### **2.1 Boosting innovation capacity**

The table below presents an overview of the main initiatives to boost innovation capacity (pillars 2 and 3 of the DEI).

**Table 5: National initiatives to strengthen leadership through collaboration and platforms**

| Name  | Industry 4UM  | Spolupracuj.me ('Let's cooperate')  |
|---|---|---|
| Type  | Digital Platform  | Digital Platform  |
| Starting date   | 2017  | 2018  |
| Objective   | Connecting businesses, research and public institutions and individuals who would like to cooperate on finding solutions for digital transformation.  | Cooperation portal is designed to help businesses in finding business partners and connect technical universities with industries.        |
| Relevant for Pillar 2 <sup>16</sup> or Pillar 3 <sup>17</sup> or both | Pillar 3  | Pillar 3  |
| Short description   | Industry4UM is an initiative of industry representatives under the patronage of the Ministry of Economy with the ambition to connect the representatives of industry and spread the information regarding the ongoing digitalisation as well as provide consultancy services. | Web portal designed to connect businesses and further their cooperation. The portal also connects technical universities with industries. |

| Name   | Industry 4UM   | Spolupracuj.me ('Let's cooperate')                        |
|--|--|---|
| Granting organisation  | Private initiative   | Union of Electrotechnical Industry of the Slovak Republic |
| Participating organisations  | Ministry of Economy and private businesses   | Private businesses and technical universities             |
| Sectors targeted   | Industry   | Industry  |
| Technologies targeted  | All  | All   |
| Funding (split by private/public and national/EU), state period/annual funding | Private  | Private   |
| Current status of initiatives  | The portal has been running since 2017, however, no statistics on created cooperation are available. A number of workshops and lectures have been held around the country. | The portal started working in 2018.                       |

### ***Impacts, challenges and perceptions***

In connection to Pillar 2, currently, there are no officially certified digital innovation hubs. However, as mentioned in section 1.3, three entities received support in this area from an EU project. Therefore, it is highly likely that DIHs in Slovakia will become operational in the near future. To further support this, the Slovak government included a specific measure in the action plan for the support of development of DIH. As a first step, a study has been commissioned, to be published by June 2019, that looks into how to set up the DIH network in Slovakia to ensure it is a one-stop-shop of services allowing the industry to access the newest digital solutions, experiments and human and industrial competences. The study also focuses on identifying the sources from which the DIH should be financed (probably ESIF and Horizon 2020). In the meantime, the Slovak Business Agency<sup>18</sup> operates a network of National business centres that function as one-stop-shops to provide information and support mainly to SMEs in a number of areas that also include digitalisation, incubator programmes, 3D printing or standardisation.

Regarding initiatives under Pillar 3, two were identified. The **Industry4UM** initiative, a private initiative under the patronage of the Ministry of Economy, serves as a platform providing solutions to businesses for digitising era. It mainly targets SMEs, although it is opened to all businesses. Its main activity is to discuss current challenges regarding digitalisation in Slovakia. However, as pointed out during the interviews, the initiative lacks public support and it is necessary that the Ministry also implements the proposed suggestions and solutions. The initiative as such is viewed positively by the industry representatives and was created by demand from the businesses.<sup>19</sup>

**Spolupracuj.me** was also set up as an answer to a demand coming from the businesses to find partners and other businesses to cooperate with. However, according to the interviewees, the initiative is not complex enough to cover the whole process of digitalisation. Even though businesses in Slovakia are very willing to cooperate in digitalisation, they lack support or initiatives which would allow them to try the newest technologies and they need to gain experience in the new environment. In general, there is a lack of consultants in the field of technology in Slovakia, whose expertise and participation would strengthen the initiative. In contrast, the strength of the initiative is that it was initiated by the industries as a result of a demand for such a platform. Hence there is an interest in the platform. The main challenges the initiative encounters are to gather enough information to be attractive for businesses and include more specialists from the field of digitalisation and technology. So far, the initiative lacks marketing and not many businesses are aware of it.<sup>20</sup>

In connection to R&D, the Ministry of Economy as well as other national agencies and private actors offer a number of supporting mechanisms, such as innovation vouchers or start-up support (see section 2.4), to further encourage investment in this area.

According to the available quantitative indicators, the status of digitalisation has been somewhat unbalanced in Slovakia over the past few years. The share of enterprises' total turnover from e-commerce has somewhat fluctuated between 2015 and 2017, yet the share of enterprises selling online and doing electronic sales to other EU countries has increased. On the other hand, the share of enterprises buying cloud computing services of medium-high sophistication has decreased from.

The figures also show that ICT spending (as percentage of GDP) in 2015 in Slovakia was 1.8% which, percentage-wise is a half percentage point below the OECD average. Nonetheless, in the perception of the stakeholders interviewed, the level of digitalisation in the ICT sector is getting closer to the medium level (2.33 on a scale from 1 to 5 where 1 is the lowest and 5 is the highest mark). Regarding the non-ICT sector, the level of digitalisation is on a medium level according to stakeholder perception (3 in a 1-5 scale). However, the stakeholder responses were less unified in this regard as the digitalisation levels vary across sectors with the automotive industry being highly digitalised but other sectors less so. The stakeholders also highlighted that so far, the government support of digitalisation has been rather low (1.67 on a 1-5 scale), nonetheless, steps are being taken to correct this.

According to industry associations, the key opportunities in Slovakia related to take-up in digital technologies are connected to the fact that Slovakia is one of the more industrialised countries in the EU, therefore, it is natural for companies to move towards the smart sectors. In this regard the automotive industry is a major influence. Further, there is a potential to make better use of investments into academic research and development as there are many ongoing projects, however, their application is close to zero.

The fact that the research and implementation are not adequately connected is seen by industry associations as a barrier to digitalisation in Slovakia. Other challenges mentioned include the lack of DIH, lack of digitalisation awareness of companies, the high financial burden connected to the introduction of new technologies to production and the fact that up until now the government support in this area, particularly in terms of financial support, has been somewhat low.

From the national authority's perspective, one of the main challenges in the area is awareness raising as some companies see digitalisation as a threat. Another barrier is that the current structure of university graduates and their skills do not correspond adequately to the needs of digitalisation. The situation should improve once a DIH is established and the measures foreseen under the action plan are implemented.

## 2.2 Regulatory framework for digital age

In connection to the regulatory framework for digital age, the Slovak digitalisation strategy and its action plan contain measures that look at what exactly industry 4.0 is and what legislative changes will need to be taken to include it into the national legislative framework. However, as DIHs are currently not present in Slovakia, no legislative changes are foreseen in connection to these hubs yet. The strategy and action plan are further accompanied by Economic Policy Strategy of the Slovak Republic until year 2030<sup>21</sup>, that is currently being negotiated, which includes the topic of industry 4.0, however, one of its criticisms is that it does only describe current trends and does not contain measures which the government would undertake to address these trends.<sup>22</sup>

The table below presents an overview of the main initiatives related to a digital regulatory framework (Pillar 4 of the DEI).

**Table 6: Overview of Slovak initiatives under Pillar 4**

|                   |  |  |
|-------------------|--|--|
| Name              | Act on Cyber security and amendments to certain laws (Zákon o kybernetickej bezpečnosti a o zmene a doplnení niektorých zákonov <sup>23</sup> )  | Computer Security Incident Response Team (Jednotka pre riešenie počítačových incidentov - CSIRT) <sup>24</sup>   |
| Type              | Cyber security regulation  | Cyber security measure   |
| Starting date     | Adopted on 30 January 2018, entry into force 1 January 2019  | 2008   |
| Objective         | To lay down the regulatory framework for cyber security.   | Increase the level of protection of the National Information Communication Infrastructure (NIKI) in the Slovak Republic.   |
| Short description | The Act establishes the national cyber security strategy and a single cyber security information system. It also regulates the organisation, scope and responsibilities of public authorities in cyber security. | The services provided by CSIRT include: <ul style="list-style-type: none"> <li>• solving information and safety incidents in cooperation with owners and operators of affected parts of NIKI, telecommunication operators, Internet service providers and other state authorities (e.g. police, investigating officers, courts);</li> <li>• Building and disseminating public awareness in selected areas of information security;</li> <li>• Cooperation with foreign sister organisations and representation of the Slovak Republic in the area of information safety at international level.</li> </ul> |
| Sectors targeted  | All  | All  |

### **Impacts, challenges and perceptions**

In connection to the Act on cyber security, the national action plan foresaw two measures. The measures do not directly target companies as they focus more on the IT system support. Firstly, the focus is on laying down conditions and requirements for the support and then by the end of 2019 provide information to companies on what they will need to implement and what type of governmental/IT support will be provided in this regard.

In connection to CSIRT, each Ministry has a dedicated team that transfers information to the National Security Authority that then further works with it. It is foreseen that a database of companies will be created that will be periodically informed about security threats. As the levels of digital transformation of Slovakia that were foreseen in previous strategies have not been met, a new action plan for 2019-2022 was adopted (see section 1.2). In relation to industry 4.0 it focuses particularly on cyber security, treatment and processing of data, and open data.

It has been highlighted by the national authority consulted that as the digital development is faster than the legislative one, national legislatures are not always able to react dynamically enough to address all the needs. Nonetheless, the industry associations consulted are aware of the government steps in these areas. The main highlighted barrier is that the investments made by the EU under the ESIF Operational Programme Research and Innovation (OP Vyzkum a Inovacie) cannot be used commercially, therefore, their potential is not completely utilised.

## 2.3 Skills development

The table below presents an overview of the main measures for digital skills development (Pillar 5 of the DEI).

**Table 7: Slovak main initiatives to develop digital skills (pillar 5 of the DEI)**

| Name   | Dual education (Dúálne Vzdelávanie) <sup>25</sup>  | Learning for the 21st century   | Digital Coalition (Digitálna koalícia) <sup>26</sup>  |
|--|--|---|---|
| Type   | Platform   | Training  | National Coalition  |
| Starting date  | 2016   | 2016  | 2017  |
| Objective  | Cooperation between vocational training and businesses.  | Supporting the development of IT sector through changes in the education system at primary and secondary and higher levels of education.  | Improving the digital skills of citizens, IT specialists and all employees.   |
| Short description  | The initiative creates a partnership between employers and students in a form of a learning agreement that regulates the rights and obligations in relation to the practical teaching. | The initiative aims to develop a model of education and training for young people providing up-to-date and prospective training to meet the needs of the labour market, focusing on IT and ICT. | The initiative aims to mobilise public, private, academic and civic organisations and institutions in Slovakia to improve the digital skills of citizens, IT specialists, all employees. Its members enter the Digital Coalition voluntarily and free of charge with a commitment to cope with the digital transformation. At the same time, each member is committed to contributing to spreading awareness about the digital transformation and its activities. |
| Granting organisation  | State Institute for Vocational Education   | IT Academy  | ITS Association   |
| Participating organisations  | Private businesses and educational institutions  | Pavol Jozef Šafárik University in Košice<br>Žilina University<br>Matej Bel University in Banská Bystrica<br>Technical University of Kosice<br>Constantine the Philosopher University in Nitra   | 52 members across education and businesses.   |
| Sectors targeted   | All  | Universities and their students   | Industries and educational institutions   |
| Funding (split by private/public and national/EU), state period/annual funding | EUR 33,626,257.73, financed by the Operational Programme Human Resources (ESF and ERDF)  | EUR 17.8 million - ESF and ERDF (Operational Programme Human Resources)   | N/A   |
| Current status of initiatives  | N/A  | N/A   | N/A   |

### **Impacts, challenges and perceptions**

The **Dual Education** initiative was the first initiative launched to develop skills for citizens suited for the needs of the labour market. The initiative was set up as a result of a mismatch between the skills employees developed during vocational training and the needs of the labour market. Although it does not directly concern digital skills, the initiative ensures that the students' skills comply with the needs of the labour market. However, the initiative lacks further support from the regulatory framework as, for example, practical vocational training (e.g. sending students attending vocational training for a work placement while studying) is not directly supported by legislation, as the vocational training institutions lose financial benefits if the students attend such a training.<sup>27</sup> To this end, the initiative is being reviewed to see how to make it more attractive so that the participation would be higher. The revision should also include better conditions for SME participation as currently they are quite restrictive.<sup>28</sup>

The **Digital Coalition** also ensures the interconnection between the skills developed in the educational system and the labour market needs; however, the initiative is more concentrated on the digital and IT skills of employees in comparison with Dual Education. Digital Coalition was set up by the ITC Association in Slovakia as a response to lack of digitally skilled workforce in Slovakia. The main challenge of this initiative, as stated during the interviews, is that it is set up on voluntary basis and does not receive financial support from any major organisation or government.<sup>29</sup> The national action plan contains a specific measure focused on supporting the activities of the coalition. So far, the measure does not foresee any financing support.

**Learning for the 21<sup>st</sup> century** was set up by the IT Academy in cooperation with the Ministry of Education. Its main purpose is to develop a model of education and training for young people providing up-to-date knowledge and skills complying with the labour market needs. It primarily focuses on IT and ICT. The project is implemented through the ESF and the ERDF funds. It aims to generate at least 1,000 new specialists per year in line with the IT sector requirements. The project targets students from 24,000 elementary schools, 9,000 secondary schools and 3,000 universities.<sup>30</sup> The interviewed industry associations pointed out that some of the challenges of this initiative include the necessity to ensure that the financial support is spent effectively, and the quality of training is secured.

Additionally, the national action plan foresees a number of measures to support technical subjects including co-financing by private entities or company scholarships. In September 2018, the Act on Vocational Education and Training<sup>31</sup> came into force that foresees the provision of hands-on education including an SME subsidy of EUR 5,000 per student to companies who take on trainees.

Slovakia's performance on human capital in connection to digitalisation is below the EU average according to the DESI 2018 results, with a low share of enterprises providing training to their personnel to develop/upgrade their ICT skills. However, Slovakia has been moving towards building the necessary capacity in recent years, introducing numerous initiatives in this regard. Further support is foreseen with the implementation of the Action Plan.

## **2.4 Support mechanisms**

As mentioned in section 2.1, there is a number of mechanisms geared towards further support of R&D.

### ***Vouchers***

Since 2013, the Ministry of Economy has been running a voucher scheme for SMEs with the aim to teach companies and educational institutions how to cooperate regarding research and innovation. For each year, a call for proposals is published with separate budgets (for 2018 the budget was EUR 125,000) to which companies can apply and choose a partner from a list of educational institutions. Once the application has been approved and the partnership has been agreed, a voucher of EUR 5,000 is granted to be used on R&D. In 2018, 25 vouchers were granted (i.e. the full budget was exhausted). In previous years, 40 to 50 vouchers were granted per year.

Within the structure of the ESF, the Slovak Innovation and Energy Agency<sup>32</sup> provides a number of vouchers connected to creative industries (in areas such as design, IT programming, architecture, etc.) that are between EUR 5,000 – 10,000 Through the Supporting development of creative industries in Slovakia project<sup>33</sup>. The project runs between 2017 and 2023 and is foreseen to allocate about EUR 7.625 million through the vouchers to 1,500 SMEs.<sup>34</sup>

### ***Start-up support***

Since 2015, a scheme is available to support start-ups within the National Conception of Start-up Support and Development of the Start-up Ecosystem in the Slovak Republic<sup>35</sup>. Under this scheme, the start-ups can receive three types of support:

1. Support for attending conferences abroad;
2. Provision of mentors (Ministry of Economy can cover expenses of up to EUR 20,000);
3. Internship programmes under which start-ups are sent to the Boston Cambridge area to learn from established start-ups.

### ***Innovation and holding funds***

The Slovak Business Agency has a Holding Fund<sup>36</sup> that can provide companies with high-risk capital in areas including digitising. Under the Ministry of Economy, there is an Innovation Fund<sup>37</sup> that focuses on the development of innovation activities. The Slovak Investment Holding<sup>38</sup>, a private company, provides high-risk capital to financial companies including in the area of digitalisation.

### 3 Conclusions

The following table provides an overview how the different digitalisation initiatives implemented in Slovakia have been funded based on the available information.

**Table 8: Breakdown for the financing of the initiatives**

|  | Pillar 2                              | Pillar 3                              | Pillar 4                             | Pillar 5                              |
|--|---------------------------------------|---------------------------------------|--------------------------------------|---------------------------------------|
|  | Digital Innovation for all            | Partnerships and industrial platforms | Regulatory framework for digital age | Preparing for digital future (skills) |
| Innovation 4UM                                       |                                       | N/A                                   |                                      |                                       |
| Spolupracuj.me                                       |                                       | N/A                                   |                                      |                                       |
| Act on Cyber security and amendments to certain laws |                                       |                                       | No budget                            |                                       |
| Computer Security Incident Response Team             |                                       |                                       | Unknown                              |                                       |
| Dual Education                                       |                                       |                                       |                                      | EUR 33.6 million (2016-2020)          |
| Digital Coalition                                    |                                       |                                       |                                      | N/A                                   |
| Learning for the 21 <sup>st</sup> Century            |                                       |                                       |                                      | EUR 17.8 million (2016-2020)          |
| SIEA vouchers  | EUR 7.625 million (2017-2023)         |                                       |                                      |                                       |
| Total spending                                       | At least EUR 59 million <sup>39</sup> |                                       |                                      |                                       |

As the results of the 2018 DESI index show, Slovakia underperforms in comparison to the EU average with regard to digitalisation, particularly when it comes to connectivity and digital public services. The country achieves average results in human capital, use of internet and integration of digital technology. In particular, Slovakia faces lack of employees with digital and ICT skills, despite the growing demand in the labour market.

In order to help the employees, students and pupils to acquire the necessary skills, business associations and the Slovak government launched three initiatives helping to unite the demands of the labour market and the educational system (pillar 5 of the DEI). The first initiative, Dual Education, does not necessarily concentrate on digital skills, however, it also helps students to acquire them, among other support areas. The initiatives Digital Coalition, connecting businesses and schools, and Learning for the 21<sup>st</sup> century, help students and pupils to develop digital and ICT skills, complying with the needs of the labour market. The initiatives are viewed positively by stakeholders, although more regulatory framework and support from the government is required to fulfil their potential.

Two initiatives also serve as platforms for networking, seeking business partners and brainstorming in terms of digitalisation and further R&D (Pillar 3 of the DEI). For instance, the initiative Innovation4UM connects businesses and serves as a discussion platform to exchange best practices and finding solutions with regards to digitalisation. Similarly, the initiative Spolupracuj.me encourages cooperation among businesses although the country currently lacks specialists such as technology consultants.

Regarding the regulatory framework (pillar 4 of the DEI), the Act on Cyber Security has entered into force in the beginning of 2019. However, the Computer Security Incident Response Team structure has been around since 2008 with its competences being expanded in response to digital developments.

Many of the Slovak digitalisation initiatives and strategies currently in force are very recent, from the past two years, therefore their influence on digitalisation in Slovakia, particularly in the long-term, remains to be monitored. To further capitalise on knowledge in the area of digitising, Slovakia also cooperates with other EU countries (Pillar 1 of the DEI), particularly with its neighbours to North and West. An initiative called Innovation Diplomacy will see cooperation efforts extended even beyond the borders of the EU. In addition, the European project 'Smart Factories in new EU Member States' focuses on providing mentoring and coaching support in connection to Digital Innovation Hubs. Three entities received this support in Slovakia, therefore, it is highly likely that at least one DIH will be created in the near future.

In general, Slovakia has a positive economic situation and the economic outlook for the future is very positive. It is one of the most industrialised country in the EU, with a dominant automotive sector. Nonetheless, this sector is quite vulnerable to the effects of digitalisation. It is, therefore, crucial that major steps to improve the situation with regards to digitalisation are taken in the future.

The table below presents a measure that can be considered a good practice.

#### **Box 1: Good practice**

##### **“Innovation4UM”**

Industry4UM is an initiative set up by the industry representatives under the patronage of the Ministry of Economy (bottom-up initiative). It serves as a discussion platform where businesses can network and discuss the main challenges arising from Industry 4.0 and further cooperate on research and development. The platform also aims to educate the public and the businesses as well as spread awareness about Industry 4.0 and be a partner to government institutions with regard to digitisation. To this end, a number of workshops and other events have been held across the country.

To conclude, the table below provides a general overview of the main digitalisation initiatives implemented in Slovakia, the level of take-up and perception of their impacts as well as the overall progress Slovakia has made so far regarding digitalisation.

**Table 9: Total input-output overview**

|             |   | Pillar 2  |  | Pillar 3   |  | Pillar 4   |  | Pillar 5   |  |
|-------------|---|---|--|--|--|--|--|--|--|
|             |   | Digital Innovation for all  |  | Partnerships and industrial platforms  |  | Regulatory framework for digital age   |  | Preparing for digital future (skills)  |  |
| Application | Name of key initiatives (start dates in brackets) | Innovation 4UM (2017) and Spolupracuj.me (2018)   |  |  |  | Act on Cyber security and amendments to certain laws (2018) and Computer Security Incident Response Team (2008)  |  | Dual Education (2016), Dual Coalition (2017) and Learning for the 21 <sup>st</sup> century (2018)  |  |
|             | Funding (total amount and period)                 | N/A   |  |  |  | N/A  |  | EUR 51.4 million between 2017 and 2018   |  |
|             | Industries addressed                              | All   |  |  |  | All  |  | All  |  |
|             | EU programme involved                             | Not applicable  |  |  |  | Not applicable   |  | ESF and ERDF   |  |
| Usage       | Perception of initiative                          | None of the initiatives identified receive direct financial support from the government. As they were initiated by the industry they are seen very positively (5/5)   |  |  |  | There is acknowledgement of steps taken, however, at the same time, there is still room for improvement in the regulatory framework. The national action plan is seen very positively in this regard (5/5) |  | The perception of usefulness of the initiatives on digital skills is rather positive, as they answer the demands of the labour market. (3.6/5)   |  |
|             | Take-up   | There are no DIHs yet.  |  | N/A  |  | N/A  |  | N/A  |  |
| Outcomes    | Perception of outcomes                            | The innovation level in the ICT sector, in comparison with other EU countries is seen as rather lacking. (2.3/5)  |  | With regard to digitalisation take-up in non-ICT sectors, there is room for improvement depending on the sector. (3/5) |  | The regulatory framework is not perceived to be fit for the digital age as it contains out-of-date definitions and old regulations. (4.5/5)  |  | The availability of the required skills and labour resources to enable digitisation is currently rather low in Slovakia. (2/5)   |  |
|             | Outcome metrics                                   | From 2017 to 2018, Slovakia's position in the DESI ranking remained the same (20 <sup>th</sup> place) although the country received a higher score than in the previous years.  |  |  |  | Between 2015 and 2017, total capex spending in Slovakia increased by almost 30%.   |  | The number of people employed with ICT specialist skills increased by 2% between 2015 and 2017. In the same period, the share of enterprises providing training to develop ICT skills fell from 19% (2015) to 17% (2017) |  |
|             | Change in outcomes                                | DESI ranking on integration of Digital Technology: 20 <sup>th</sup> in 2017 and 2018  |  |  |  |  |  |  |  |
| End-goal    | Productivity growth                               | Between 2010 and 2017, the real labour productivity per person employed in Slovakia increased by 10.5%, with the highest increases in 2016 (9.5%) and 2017 (10.5%).   |  |  |  |  |  |  |  |
| Summary     |   | The measures of the national action plan on digitalisation will be implemented from 2019 onwards. Nonetheless, there are already a number of initiatives in Slovakia aiming to improve the digital environment and uptake in the country, with some of them being organised bottom-up based on the demand from the industries themselves. |  |  |  |  |  |  |  |

## ANNEX 1 List of stakeholders interviewed

| Type of stakeholder  | Name of organisation                       |
|----------------------|--|
| National Authority   | Ministry of Economy of the Slovak Republic |
| Industry Association | Chamber of Commerce                        |
| Industry Association | ITS Association                            |

## ENDNOTES

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<sup>3</sup> SARIO (2017) 'Automotive Sector in Slovakia' Available at: <https://www.sario.sk/sites/default/files/data/sario-automotive-sector-in-slovakia-2018-02-01.pdf>.

<sup>4</sup> European Commission (2018): Digital Economy and Society Index 2018, Country Report Slovakia, available at: [http://ec.europa.eu/information\\_society/newsroom/image/document/2018-20/sk-desi\\_2018-country-profile\\_eng\\_B4415E7E-9154-E26E-7B403212919F3F7C\\_52238.pdf](http://ec.europa.eu/information_society/newsroom/image/document/2018-20/sk-desi_2018-country-profile_eng_B4415E7E-9154-E26E-7B403212919F3F7C_52238.pdf)

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<sup>10</sup> Information provided by the Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatisation.

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<sup>13</sup> Smart Factories in new EU Member States. Available at: <https://smartfactories.eu/>.

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- <sup>15</sup> Pravda (2018) Slovensko bude mať prvých štyroch inovačných diplomatov v histórii, Available at: <https://www.hlavnespravy.sk/rasi-slovensko-mat-prvych-styroch-inovacnych-diplomatov-historii/1593692>.
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- <sup>39</sup> However, the figure does not include all of the initiatives as the exact financing for some of the initiatives is unknown.