Analysis of National Initiatives for Digitising Industry.

Czech Republic: Společnosti 4.0

MINISTRY OF INDUSTRY AND TRADE CZECH REPUBLIC

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Disclaimer: The views expressed in this document are those expressed by the experts conducting the analysis of the National Initiatives on digitising industry and do not necessarily represent the view of the European Commission and the National Initiative on the subject.

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Executive Summary

General Background: The Czech economy is the 48th worldwide economy. The motors of the Czech economy are manufacture of motor vehicles, trailers and semi-trailers, production of rubber and plastic goods, manufacture of electronics, and the production of computers, electronic and optical devices and equipment. The country has strong industrial ties to Germany, which is its strategic business partner. Czech companies mainly supply industrial components to its neighbouring country, thus integrating into the German industrial supply chain. However, Employment in the manufacturing industry is concentrated on low-tech sectors (in 2014, 55% of those employed in manufacturing worked in technologically low-tech sectors), sectors with a high level of physical labour that in the future will be most easily replaceable with relevant technologies.

The Czech Republic ranks 18th out of the 28 EU Member States (0.52). Concerning connectivity, the Czech Republic has a medium-high rank in fixed broadband take up (16). Over three quarters of the Czech Republic (79%) are online and 54% of the population has basic digital skills. ICT professionals represent an increasing share of employment (3,7%; rank 10), but the number of STEM graduates must significantly improve to enable companies to recruit the ICT specialists they need. The Průmysl 4.0 initiative (2017-2020) provides an integrated framework dealing with (1) Innovation capacity with technological investments concerning applied research, standardization, safety/security/reliability. (2) Actions to promote digital skills both education, vocational training and company involvement with academia. (3) Complementary measures (e.g. tax incentives, development loans).

National Strategies towards "Digitizing European Industries":

The Initiative Industry 4.0 (originally "Průmysl 4.0") was prepared by the Ministry of Industry and Trade in close cooperation with industry and academia and approved by the Government in August 2016 (http://www.mpo.cz/en/industry/industry-four/). The initiative involves different ministries according to relevant measures, business associations and trade unions, academia. Industry 4.0 Initiative opened a broad discussion on its economic and societal consequences which led to establishing the Alliance Society 4.0 (approved by the Government in February 2017) and Průmysl 4.0 is taken into consideration by the Action Plan on Society 4.0 (approved by the Government in September 2017).

Digitising European Industry (DEI) - Pillar 1 – Digital Industrial Platforms and R&I actions

The first pillar of the DEI strategy is mainly supported by pillar 1 and pillar 5 of the Action Plan on Society 4.0, namely Connectivity and Mobility and Industry, Business and Competitiveness. These pillars support on one hand, measures related to infrastructure development, building online networks for digitalization of transport, the development of space technology and applications or digitization for television broadcasting. On the other hand, measures supporting the development of industry 4.0, but also with other aspects of digital economy, such as start-ups, online platforms, shared economy and digital transformation. The Czech Initiative has already budgeted a total investment of 290M€ for the development of such initiatives via OP PKI and TA Trio/Gama/Beta/Epsilon Programmes.

Digitising European Industry (DEI) - Pillar 2 - Standardization actions, regulation and testbeds

This DEI pillar is particularly aligned with the security pillar of the Action Plan on Society 4.0, namely security, which intends to develop activities aimed at ensuring cyber security and the protection of privacy and personal data. The budget allocated to this type of activities will become available as the various programmes define in more detail the projects to be implemented

Digitising European Industry (DEI) - Pillar 3 - Digital Innovation Hubs actions.

The Czech Republic initiative is already planning to bring cooperation across industry, academia and investors to a new level. More importantly one of the high level priorities is to make available the infrastructures and resources needed to develop a strong Czech offer for industry 4.0 products and services. This is realised through National Application Oriented Research Centres for Industry 4.0. This is to be supported with funds coming from OP PKI, which account for 4,5B€. The second dimension of the DIH pillar is related to the education and labour market and Industry, business and competitiveness pillars that are promoting the Work 4.0 programme and the acceleration and start-up of new digital business in the Czech republic. This dimension of the strategy is to be supported TA CR programme and supported by Work 4.0 actions, which are part of the 5,78B€ made available as part of the digital skill budget for Omega, OP PZ and OP VVV Programmes. This is to be supported by the implementation of maturity assessment tools made available by the Industry 4.0 initiative to guide Czech companies in the migration towards digital business models and services.

Digitising European Industry (DEI) - Pillar 4. Skills development.

Skills development is a key aspect of the national strategy that encompass not only the private sector but also the public one. The skills development pillar mainly relates to Education and the labour market pillar of the national strategy, which supports the modernization of initial training, supporting further education and setting labour market conditions in a context of technological changes and possible adjustment of the regulatory framework. As indicated above, the national programmes dealing with digital skills strategies have already budgeted 5,78B€ to be distributed across all actions planned and mainly being supported by Structural Funds made available to the Czech Republic. Such significant investment will allow the implementation of comprehensive Education 4.0 and Work 4.0 programmes as part of the Society 4.0 Action Plan.

Specific national measures

The national initiative is also considering the implementation of specific actions intended to foster digital innovation with specific financial business support and specific vouchers for innovation. The national initiative is budgeting 49M€ for such incentives. However, it is worth noting that the attractiveness of the Czech Republic for digital business development is already very high with a digital tax index of 7,48% much more favourable than the ones exhibited by Germany, Spain or France.

Fiche of the Czech Republic

1. Introduction

I.1. Overall economic situation of the country

Czech Republic economic landscape. Czech Republic Gross Domestic Product (GDP) of $192.925 M is the 48th worldwide with the US leading the ranking. In terms of Industrial Aggregated Value, the ranking of Czech economy is very similar but in this case China leads the overall ranking closely followed by US.

Industry ecosystem structure. The Czech industry holds an unrivalled first EU position in terms of percentage share in overall national economy measured as added value in factor costs. This results in a significant contribution of manufacturing to the country GDP. However, the manufacturing landscape of Czech industry presents clear characteristics that need to be considered in order for a national strategy to be successful in motivating industry for a digital transformation and making both the knowledge, technological and financial resources to realise such transformation. Digital transformation and consequently manufacturing process and service innovation is a process that affects the whole organization, therefore, the ability to make long-terms decisions that can be combined with more short-term economic targets and objectives that need to be met by daily business is one of the critical aspects that need to be considered in the current Czech industrial ecosystem. Czech long-term strategic thinking is conditioned and it is framed in the context of a significant proportion of Czech businesses being owned by foreign or domestic financial groups or being part of large multinational groups with international decision making centres. Moreover, in the SME context one should consider that Czech companies are owned by top management or an owner with different close ties to the company executive.

Economic Motors. Traditionally the sectors contributing the most to the growth of industrial production are

- manufacture of motor vehicles, trailers and semi-trailers,
- production of rubber and plastic goods,
- manufacture of electronics, and
- the production of computers, electronic and optical devices and equipment.

Accounting for around 70% of country exports. The Czech Republic has one of the highest shares of industrial production per GDP among EU countries (approximately 32% GDP). Furthermore, the country has strong industrial ties to Germany, which is its strategic business partner. Czech companies mainly supply industrial components to its neighbouring country, thus integrating into the German industrial supply chain. The Czech Republic is a small, open and highly industrialised economy. Historically a long tradition in the industry and high share of industrial manufacture on the Czech economy put the country into a specific position, and the Czech path will most likely differ from the other countries, as history proved in the case of previous industrial revolution.

In comparison with small developed economies, a high proportion of the workforce is tied to the manufacturing industry in the Czech Republic (24% of all employed in 2014), this despite a drop in its significance in terms of overall employment levels. Employment in the manufacturing industry is concentrated on low-tech sectors (in 2014, 55% of those employed in manufacturing worked in technologically low-tech sectors), sectors with a high level of physical labour that in the future will be most easily replaceable with relevant technologies.

I.2. Overall strategy / situation concerning the digitization of manufacturing / production

Context. In light of the highly open Czech economy, it is important for Czech industry to follow and respect the developments in industrially developed foreign economies in the field of digitisation and advanced automation of industrial production and all processes associated therewith. Nevertheless, due to the specific position of Czech industry resulting from the traditionally high level of industrial manufacture in the country's overall economy, the Czech path to the Fourth Industrial Revolution will likely differ from that of foreign economies, as was the case in the previous industrial revolutions. At that time the influence of Czech industry on foreign industry was highly evident and now again we must not miss the chance to be one of the important players.

Timing. The Initiative Industry 4.0 (originally "Průmysl 4.0") was prepared by the Ministry of Industry and Trade in close cooperation with industry and academia and approved by the Government in August 2016 (http://www.mpo.cz/en/industry/industry-four/). The initiative involves different ministries according to relevant measures, business associations and trade unions, academia. Industry 4.0 Initiative opened a broad discussion on its economic and societal consequences which led to establishing the Alliance Society 4.0 (approved by the Government in February 2017[1]) and Průmysl 4.0is taken into consideration by the Action Plan on Society 4.0 (approved by the Government in September 2017).

Goal. The goal of the Initiative Industry 4.0 is to show possible trends and outline measures that would not only boost the economy and industrial base in the Czech Republic, but also to help prepare the entire company society to absorb this technological change.

Strategic Action Lines. The initiative provides an integrated framework dealing with

- Innovation capacity: Digital Innovation Hubs, Competence Centers, Industrial Platforms, Pilots projects, Test beds. Průmysl 4.0 measures include the support to investment, technological prerequisites and vision, requirements concerning applied research, standardization, safety/security/reliability.
- Actions to promote digital skills: education, vocational training, company involvement, research programmes, academia. It considers the impacts on labour market, skills and social impacts, as well as impacts on education system. It includes measures to support human resources development and life-long learning.

[1] http://digiczech.eu/vlada-se-vydala-na-cestu-ke-spolecnosti-4-0-a-podporila-tvorbu-digitalne-privetive-legislativy/

- Complementary measures (e.g. tax incentives, development loans). It deals with cyber security and relevant legislation, application of innovative technologies in energy, transport and Smart Cities. Smart devices & technology innovation.

Digital Industrial Transformation Enablers. The Průmysl 4.0 initiative envisions some technological preconditions and visions, where particular technologies will play a critical role in the vertical, horizontal and all engineering phase integration promoted by Industry 4.0. The technologies addressed by the Průmysl 4.0 initiative include:

- Big data.
- *Autonomous robots*
- *Communication infrastructure*
- *Cloud computing*
- *Additive manufacturing*
- *Augmented reality*
- *Sensors, IoT.*
- *Cybernetics and artificial intelligence.*

National Initiative Coordinates. The initiative will be followed up on an ongoing basis within the Action Plan on Society 4.0 which will be continuously updated.

Facts on the Czech Republic Initiative 'Průmysl 4.0'	
Ministry in Charge	Ministry of Industry and Trade of the Czech Republic[2] [Website]
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Main Strategy Documents	Průmysl 4.0 (Czech)[3] Společnosti 4.0[4]

[2] https://www.mpo.cz/en/industry/industry-4-0/

Related Strategy documents	Industry 4.0 – Experts reference document (English)[5]

I.3. Digitization level of the country

Qualitative analysis. The Czech Republic ranks 18th in DESI 2017. Compared to last year the country progressed in Digital Public Services and remained stable in Human Capital, but worsened its ranking in other dimensions. The country performs best in Integration of Digital Technologies by Businesses, mostly because many SMEs embraced eCommerce. The country's greatest challenge in digital is to improve the use of internet services, in particular for eGovernment and for entertainment and social purposes. Czech Republic belongs to the cluster of medium performing countries.

Quantitative analysis. In DESI 2017, the Czech Republic has an overall score of 0.50 and ranks 18th out of the 28 EU Member States (0.52). Concerning connectivity, the Czech Republic has a medium-high rank in fixed broadband take up (16), while it scores Number 9 in 4G coverage and rank 18 in mobile broadband take-up. During the past year, the Czech Republic has even improved in fast broadband subscriptions. Over three quarters of the Czech Republic (79%) are online and 54% of the population has basic digital skills. ICT professionals represent an increasing share of employment (3,7%; rank 10), but the number of STEM graduates must significantly improve to enable companies to recruit the ICT specialists they need. The Czech Republic ranks high in the use of internet by citizens (13). Czech internet users perform banking transactions and increasingly shop online (63% and 57% respectively); they use internet for content (music and video) and communication (social networks) less than the average European (they rank 24 and 26 respectively)..

Czech Republic businesses in particular SMEs, largely use internet as sales channel; a quarter of them sell online, half cross-border, and they are 2nd in the EU in terms of eCommerce turnover. However, the use of other digital technologies is more limited. They show a low adoption rate of cloud computing (10%, rank 20), but 26% (rank 4) are selling online. 21,7% of Czech companies are using electronic invoicing (rank 2), and a 11,8% are selling online cross-border (rank 3). In 2017, the country has progressed in both demand and supply of eGovernment services over the past year, although performance remains below EU average, particularly in terms of the users of eGovernment services (rank 26).

[3] https://www.mpo.cz/en/industry/industry-four/
[4] https://www.dropbox.com/s/f1cgum0xv5vjhe7/Ak%C4%8Dn%C3%AD%20pl%C3%A1n%20pro%20Spole%C4%8Dnost%204.0.pdf?dl=0
[5] https://www.ciirc.cvut.cz/wp-content/uploads/2016/08/2016-08CzechInitiativeIndustry4-0.pdf

2. National Strategy towards "Digitizing European Industries"

Průmysl 4.0 (Industry 4.0) is a national initiative aiming to maintain and enhance the competitiveness of the Czech Republic in the wake of the Fourth Industrial Revolution. The concept was firstly presented during the 57th International Engineering Fair in Brno, September 2015 and approved by the Government of the Czech Republic on 24th August 2016. The Ministry of Industry and Trade plays a key role in the implementation process, however, there is a strong interdisciplinary cooperation between the ministries, social and industrial partners and academia.

The Government is planning to use already existing financial tools and budgets, e.g. Operational Programmes, to meet the demands of Průmysl 4.0 programme. The implementation of the Průmysl 4.0 initiative derives from the outputs of a coordination platform "Alliance Society 4.0" bringing together experts and policy makers and set up by The Ministry of Industry and Trade.

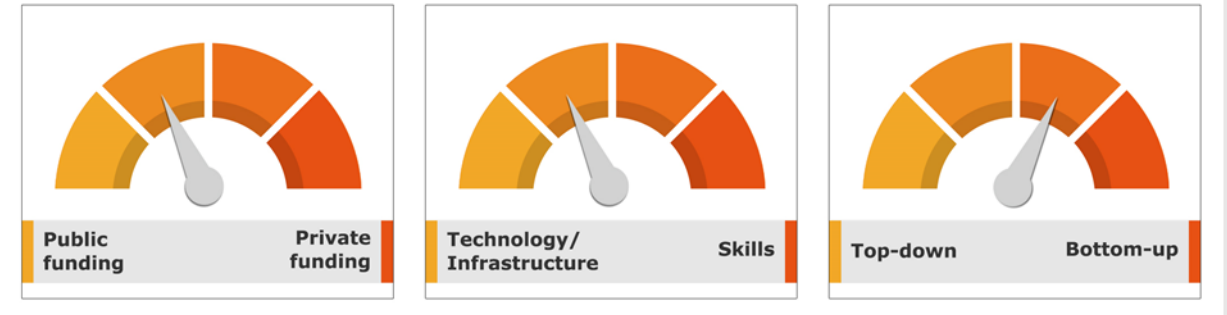
Průmysl 4.0 is not a reactive policy to I4.0. On the contrary is a proactive exercise to shape industry and society with respect to the industrial digital transformation associated with Industry 4.0 technologies and advanced manufacturing processes.

From a policy perspective Průmysl 4.0 provides a profound analysis of I4.0 on society and does not limit itself to a technical evaluation of technologies that will disrupt traditional manufacturing processes and manufacturing systems. It is a holistic and integrated approach that

- Builds on data and communication infrastructure,
- Adapts the education system,
- Introduces new tools in the labour market,
- Adapts the fiscal support and framework for digital companies.

The Ministry of Industry and Trade has a steering role in the initiative. However, the Průmysl 4.0 is eminently bottom-up approach with a balanced combination of views and inputs from experts from the social, business, scientific, industrial and academic communities. Moreover, the role of the state is to create a good business environment and define a clear innovation policy with an efficient funding model rather than just provide direct financial support.

Policy levers for Czech Republic's Průmysl 4.0



Source: Digital Transformation Monitor

The main instruments that will be used for the implementation of the Průmysl 4.0 action plan are related to the Operational Program Enterprise and Innovation (OP PIK), which is already resourced

with 4,5B€. Under this framework, Průmysl 4.0 will allow the development of the DEI pillars (digital platforms, DIH, skills, infrastructures and applications) through suitable programmes such as Potenciál (Potential), Aplikace (Application), Partnerství znalostního transferu (Knowledge transfer partnership), Proof of Concept for commercialisation of the research results. Služby infrastruktury (Infrastructure Services) and Spolupráce (Cooperation). This framework would be complemented by modifications on the investment laws that would turn Czech Republic a more attractive market for foreign investments on the manufacturing capacities of Czech industry.

While OP PIK would address the needs for I4.0 product, process and business innovation, additional operation programmes from the Ministry of Education, Youth and Sports and the Ministry of Social Affairs will address the needs of the national initiative to deal with educational and social digital transformation.

The main source of financial support for the Průmysl 4.0 action plan will come from European Structural and Investment Funds, as well as from funding programmes promoting technology and knowledge transfer between academia and industry; e.g. Trio, Gamma, Epsilon.

The current status of Průmysl 4.0 has already established a clear framework and priorities for the development of a I4.0 initiative that will transform industry and society and will embrace digital enablers. At the educational level an action plan (Society 4.0) has been approved in February 2017. To deal with the digital up- and re-skilling required to meet the demands of future digital advanced manufacturing processes, business models and industry. To decide on the actual areas of action the Ministry of Industry and Trade is carrying out a wide and open consultation not only with a wider range of policy makers but also with academia, unions, industry associations and research centres, so the priorities for the action plan are set for maximum impact in society and industry.

The initiative also envisions the creation of a national network of applied research centres for Industry 4.0 and with a focus on increasing the innovation potential of Czech industry. This network would be instrumental in strengthening the cooperation with test-beds and private sector on the realisation of challenging research projects providing the solutions for industry.

The Action Plan addresses the industrial and social reluctance to change due to both short-term economic interests and lack of sufficient understanding of the transformative effect of Industry 4.0 and digital technologies in society. The lack of a suitable broadband infrastructure that could meet the demands of data-intensive and information centric digital manufacturing processes that will support Industry 4.0 advanced manufacturing is of the Czech Government concern now.

3. Digitising European Industry (DEI) Pilar 1 - Digital Industrial Platforms & Research, Development and Innovation actions.

Despite the fact that overall spending on applied research and experimental research (AER) in the Czech Republic has long been growing in absolute terms, their share of total R&D expenditures has stagnated, is relatively low in international comparison, and does not correspond at all to the important position of the manufacturing industry in the structure of the Czech economy The total expenditure on R&D in the Czech Republic in 2014 reached CZK 85.1 billion, which represents 2% of the GDP. Of this volume spent on R&D, 69% was used to realise applied research and experimental research and 31% for realisation of basic research. Compared internationally however, the Czech Republic is one of the countries with a relatively low proportion of spending on applied and experimental research in the structure of overall R&D spending, which is noteworthy in light of the significant emphasis on industry in the Czech economy. The low number of international patent applications indicates that a highly limited number of (technologically) significant findings of applied research that make sense to protect internationally by patenting are produced in the Czech Republic.

Unlike leading innovation economies (e.g., Germany, Switzerland, Sweden, and the Netherlands), the Czech Republic is home to few headquarters of leading technological companies. A number of them, however, have their development centres and important production plants in this country (e.g., Siemens, ABB, Honeywell, and Bosch). The Průmysl 4.0 therefore focuses funding on key areas for Industry 4.0. To this end Průmysl 4.0 plans to continuously analyse the real needs of Czech industrial practice and create an inventory of capacity for relevant applied research and its potential for growth.

The focus of support for applied research therefore has to be based on a combination of a strong industrial base (sector-related structure of company investments in R&D or export performance and added value), the quality and concentration of public research (existing research structure and quality of the research produced by research groups) and prediction of technological and social development.

For the Czech economy, the following technological areas in particular are key:

- Automation and robotics
- Cyber-physical systems
- Development of specialised SW (e.g., for computer security, simulation, monitoring, computer vision, for big data analytics, for 3D printing, etc.)
- Development of system integration resources, monitoring (SCADA)
- Narrowly specialised interdisciplinary branches, e.g., production of electronic microscopes, production of optical instruments, production of instruments for micro- and nano-mechanical measuring and testing, photonic systems, production of specialised sensors
- Mechatronics
- Logistics systems (important for optimising production and supplier processes)

Experienced research teams above critical size can be found, for example, in the following technological areas:

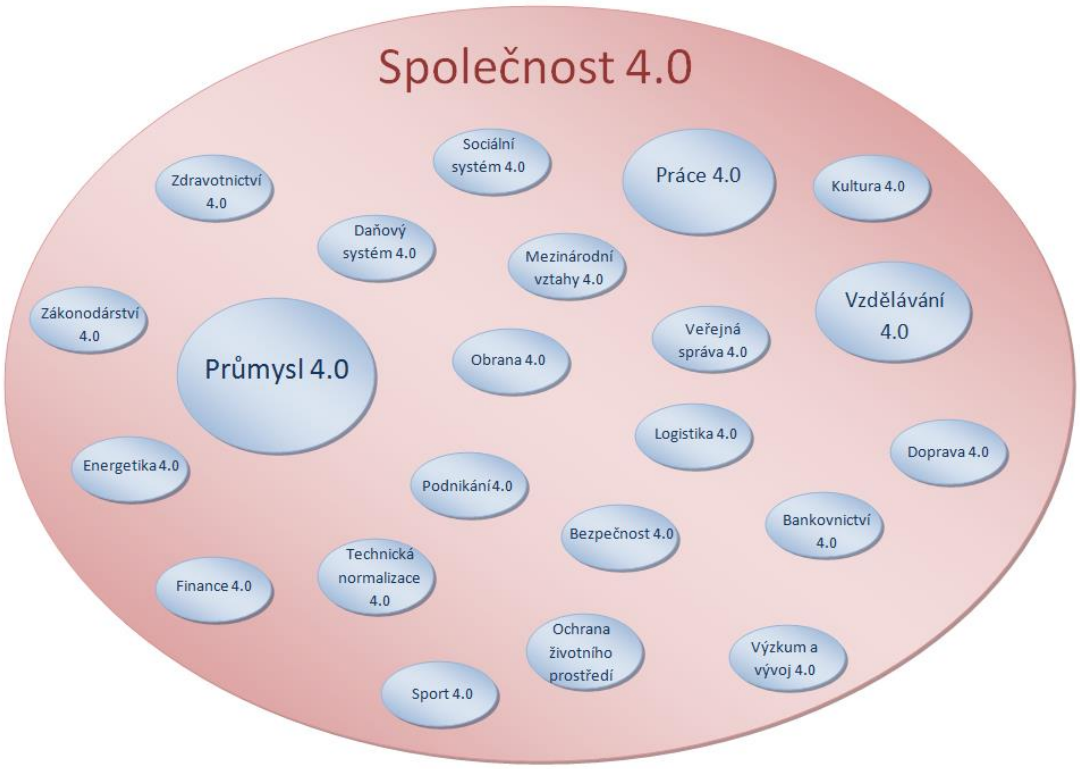
- Control systems and automatic control algorithms
- Intelligent and industrial robotics, intelligent systems
- Special sensors (non-destructive defectoscopy, vibrations, radiation)
- Advanced systems for propulsion control for industry and electromobility, generally and even other electromobility technologies
- Machine monitoring and diagnostic systems, predictive maintenance support, simulation instruments
- HMI, including voice and haptic interfaces, and virtual reality systems
- Stimulation and optimisation systems
- Measurement and analysis of noise, vibrations and dynamics of machines
- Aeromechanics (circulation)
- New materials (material engineering), including nanomaterials
- Micro- and nano-electronics, photonics, laser technology
- Theory and practical application of system integration
- Industrial design

This context of expertise, technology focus and business priorities results in Průmysl 4.0 addressing four different types of projects for the development of Průmysl 4.0 initiative

- **Extensive projects dealing with research and development of new technologies and open platforms** (nationally and internationally)**.** Here it will be necessary to prepare major and long-term projects, the execution of which will be entrusted first and foremost to big National Centres in terms of virtual infrastructure under European rules of public support. These centres may make effective use of research infrastructure built for example as part of OP RDI projects (especially centres of excellence and selected regional research centres), as well as experience and outputs of existing collaborative applied research projects of the TA CR Competency Centre type.
- **Projects dealing with the specific implementation of newly development technologies or modification of open platforms to the specific needs of the final product, final contract or new service.** Projects of this type will be dealt with especially in the form of collaborative research between a competent research organisation (such as a National Centre) and an enterprise. Greater involvement of companies that do not have their own research teams but are interested in developing a new product or innovating an existing product is anticipated here.
- **Projects promoting the development of technologies for creating new markets and especially new services.** This concerns first and foremost support for the development of innovative, technological solutions that change models of behaviour of market participants, transform markets for products and services, and create entirely new business opportunities or entirely new products and services for the global market. This concerns not only support for technological accelerators and start-ups for the needs of various Industry 4.0 projects, but also projects that combine technology with a new way of commercial and economic thinking.
- **Accompanying projects for the development of human resources in the field of research and development.** Projects of this type will be focused on strengthening the competency of

research teams, strengthening cooperation and the transfer of knowledge between research institutions as well as to international and intersectoral mobility.

On 25th September 2017, the Czech Government devoted itself to definition of the **Action Plan for Society 4.0 (Společnost 4.0)** and the **Principles for Creating Digitized Legislation**. The Society 4.0 Action Plan is the overarching government document for the Digital Agenda and so-called 4.0 Companies; of which Průmysl 4.0 is a key component. Digitally-friendly legislation is the basis for 21st century public administration and for its efficient and optimized performance. The processing of both materials is based on the tasks set out in the Digital Market Development Action Plan.

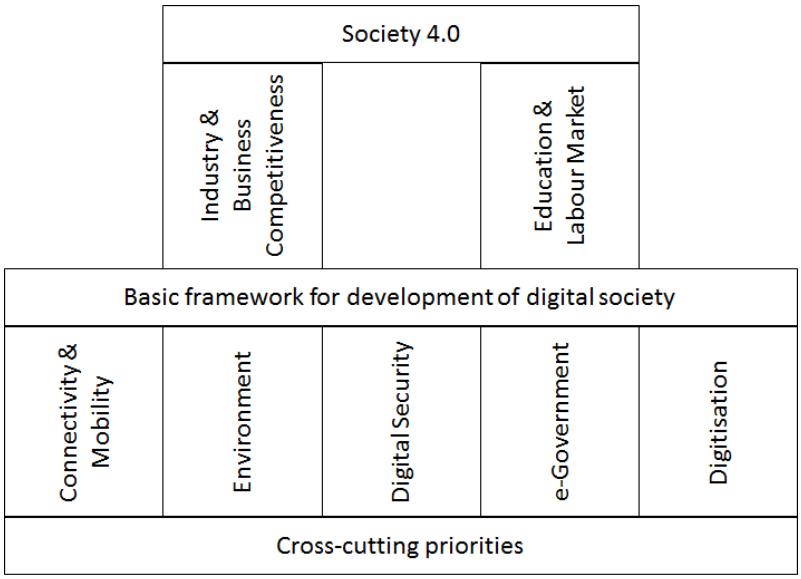


The Action Plan for Society 4.0 formulates the priority tasks that the government sets out in the context of societal challenges related to the impact of digital technology deployment on the economy and society. The material represents specific areas that need attention in the interest of the successful development of Czech society. These are the Society's 4.0 pillars:

- **Pillar # 1. Connectivity and Mobility** It supports masures related to infrastructure development, building online networks for digitalization of transport, the development of space technology and applications or digitization for television broadcasting.
- **Pillar #2. Education and Labor Market.** Supports the modernization of initial training, supporting further education and setting labour market conditions in a context of technological changes and possible adjustment of the regulatory framework
- **Pillar #3. Computerization of Public Administration.** It supports the digitization process in some areas of public administration, such as tax administration, public health, customs

administration and enforcement of certain principles and values digitization of public administration (availability and transparency, open data, evaluation system of public administration).

- **Pillar #4. Security.** It supports activities aimed at ensuring cyber security and the protection of privacy and personal data.
- **Pillar #5. Industry, Business and Competitiveness.** It addresses important issues related not only with industry 4.0, but also with other aspects of digital economy,such as start-ups, online platforms, shared economy and digital transformation.



Such Society 4.0 pillars nicely map to the European Digitising European Industry (DEI) pillars.

Society 4.0 Pillar	DEI Pillar 1 - Digital Platforms	DEI Pillar 2 - Standardisation	DEI Pillar 3 - Digital Innovation Hubs	DEI Pillar 4 - Digital Skills
Connectivity and mobility	•			
Education and the labor market			•	•
e-Government				
Security		•		
Industry, business and competitiveness	•		•	

The action plan for the Society 4.0 is an umbrella document of the Government for the digital agenda. The action plan provides the direction of government policies and key government measures to support the development of the digital market in the Czech Republic, which builds on existing content from the Action Plan for the development of the digital market. At the same time it formulates other priority tasks that the government has set in the context of the societal challenges associated with the impact of the introduction of digital technologies in the economy and society - so-called the fourth industrial revolution. The ambition of the Action Plan does not replace the existing and approved conceptual documents, but it sets a specific timetable for implementation of the priority tasks. Compared with the previous Action Plan for the development of the digital market target, it deals with a wider range of issues and challenges, recognizing their interconnectedness and defining its scope based on the concept of Society 4.0, which the government sees as widespread and gradually ongoing social change and a result of increasing digitization including the use of the Internet of Things and Artificial Intelligence in many areas of economic and social life. These include

industry, construction business, manufacturing and services, energy, raw materials, labour market, education, research and development, environmental protection, agriculture, health, transport, financial sector, security and cyber security, governance, standardization, as well as legislation and fiscal and economic policy.

For the purpose of a comprehensive approach to the problem and coordination of the Company's 4.0 digital agenda at the national level, in February 2017, the Alliance Society 4.0 was established, with the aim to discuss and coordinate the formulation and implementation of all measures related to the agendas of the Society 4.0. The Alliance is a platform for cooperation of government, economic and social partners and academia. The Alliance is an initiative of the government, its ambition, however, is the inclusion of all relevant stakeholders in order to use synergies and potential of the fourth industrial revolution to increase the competitiveness of the Czech economy and positive societal change.

The company Alliance 4.0 is formally structured into three levels - strategic control and execution co-ordination. **Strategic level** It embodies particular political representatives chosen from among the members of the government. The other two levels are represented by various chairmen. Specifically, the Alliance provides at strategic level a board from economic ministers extended by representatives of economic and social partners (PEM +). This board is chaired by the Prime Minister. **Management level**. It is represented by the Alliance Steering Committee, whose role is already played by the working group for the digital economy of the Government Council for Competitiveness and Economic Growth (RVKHR) led by the coordinator of the digital agenda. The **Working-Group level coordination committee** ensures to address industry needs as well as other agendas of the Society 4.0. Consider, for example, set up a separate committee on the Impact of the fourth industrial revolution in the labour market and education. Connection with the activities and expertise in academia provides the Alliance Academic Advisory Board, which is its consultative body.

The Society 4.0 also includes the agenda for the Initiative Industry 4.0 (Průmysl 4.0) to which the Government Resolution no. 729/2016 imposed tasks to members of the government and called for cooperation of economic and social partners, in particular the Confederation of Industry of the Czech Republic (SP ČR), the Economic Chamber of the Czech Republic (HK ČR) and the Czech-Moravian Confederation of Trade Unions (CMKOS). Now the changes taking place in industrial production through its growing digitization and automation is at the core of the process leading to the Society 4.0. The social impacts of Industry 4.0 will then be properly and timely captured and avoid economic or societal risks that may emerge from the implementation of the fourth industrial revolution. This concerns in particular the labour market (Work 4.0 initiative by MLSA) and Education (Education Ministry initiative Education 4.0).

The full set of measures of the Society 4.0 action Plan can be summarised in the following Table for each of the pillars of the national alliance:

	Title of action	Coordinator	Co-responsibility	Timeline
CROSS-CUTTING PRIORITIES				
SUPPORT OF DIGITAL SINGLE MARKET IN EUROPE				

I.	Promote the Digital Single Market policy	Coordinator	CC, resorts	continuously
II.	Coordinate the negotiating position of the Czech Republic for the field of European economic data	Coordinator	resorts	continuously
DIGITALLY FRIENDLY LEGAL AND LEGISLATIVE ENVIRONMENT				
III.	To present principles for creating a digitally-friendly legislation	Coordinator LRV		3Q 2017
IV.	Activities aimed to familiarize the public administration and the wider public of the content of policy	Coordinator LRV		4Q 2017
V.	Evaluate the principles for creating a digitally-friendly legislation and consider next steps	Coordinator LRV		3Q 2018
VI.	Develop an analysis of procedural legislation	Coordinator	MV	4Q 2017
#1 CONNECTIVITY AND MOBILITY				
Building a network of Internet				
1.1	Implementation of the National Plan for the development of next generation networks	MPO		continuously 2017-2023
1.2	Implementation of the Action Plan for the implementation of non-subsidy measures to support the planning and construction of electronic communications networks	MPO	Coordinator	continuously 2017-2020
1.3	Update spectrum management strategy	CTU		2Q 2017
Building a communication environment of public administration				
1.4	Concept development of the communication environment of public administration	MV		1Q 2018
Revision of the EU regulatory framework for networks and electronic communications services				
1.5	Promoting Czech Republic's position in discussing the draft revision of the Telecoms Framework	MPO		continuously
Transport and Development of Space Technology				
1.6	Preparation of the project covering the main road and rail routes high-speed internet and data services in sufficient quality and capacity	MD, MPO	CTU	2Q 2018
1.7	Preparation of project quality full coverage of infrastructure technologies, wireless communications	MD, MPO		2Q 2018

1.8	Exploring the possibility of using public networks of mobile operators to transfer data to ensure uptime track its operation or rail transport operation	MD, MPO	CTU	4Q 2017
1.9	Verify the functionality of the services provided on the same or adjacent frequencies directly to the needs of road transport	MD, MPO	CTU	4Q 2017
1.10	Continue developing and testing new technologies and specialized components to operate safe and fully autonomous vehicles, which will represent a new form of transport	MD	other central government bodies	continuously
1.11	Develop Action Plan autonomous control	MD		4Q 2017 / 1Q 2018
1.12	Preparation of the National Space Plan for the period 2020-2025	MD		2019
1.13	Securing long-term funding of space activities in the Czech Republic and the Czech Republic's participation in an optional program of ESA	MD		2018
infrastructure development				
1.14	Information System technical infrastructure of public administration	MV		3Q 2017
Digitization of television broadcasting				
1.15	Implementation of the Strategy of development of terrestrial digital television broadcasting	MPO		1Q 2021
The development of terrestrial digital broadcasting of Czech Radio				
1.16	Implementation of the measure, which regulates the proposal terrestrial digital broadcasting development of Czech Radio	MK		4Q 2021
E-Support				
1.17	Promoting the Czech Republic's position in discussing the draft regulation ePrivacy	MPO		continuously
1.18	Initiation of treatment impact study design ePrivacy Regulation	Coordinator	MPO	4Q 2017
#2 EDUCATION AND LABOR MARKET				
Initial training				
2.1	Public education explaining key influence digital technologies in education	MSMT		continuously

2.2	Setting principle of openness education	MSMT	MK	continuously
2.3	The development of digital infrastructure in schools	MSMT		4Q 2018
2.4	Support for innovation in education and the activities of the Czech National Coalition for Digital Jobs	MSMT, NUV		4Q 2017
2.5	The development of digital competences and informatics thinking of pupils	MSMT		4Q 2017
2.6	Thee development of digital skills and thinking informatics teachers	MSMT		continuously
Support for further education				
2.7	Mapping projects, courses and seminars in the field of digital learning	MSMT	MPSV	continuously
2.8	Support for training of civil servants in digital competences, use ekurzů	MPSV		4Q 2020
2.9	Proomoting physical access to digital technologies	MPSV		4Q 2020
2.10	Promoting participation of people at risk of unemployment on the practices and professional internships	MPSV		4Q 2020
2.11	Support for training of employees of SMEs and self-employed persons in specific and non-transferrable digital competence	MPSV		4Q 2020
2.12	The introduction of intergenerational programs and community learning to improve the availability of digital learning	MPSV		4Q 2020
2.13	Support for individual training of employed and unemployed persons in specific and transferable digital competence - arranging additional retraining courses	MPSV		4Q 2020 continuously
2.14	Ensuring economic instruments to promote the physical access of persons with low social status to digital technology	MPSV		4Q 2020 continuously
2.15	Promoting the use of existing electronic services of the public sector with an emphasis on raising public awareness	MPSV		4Q 2020 continuously
Support of further education, new forms and individualization				
2.16	Expansion of further professional training and retraining	MPSV, GRUP	MSMT, TPZ	2017 - 2019

2.17	Raising awareness and promotion, preparation for change, information support	MPSV, MSMT	GR UP, NUV, FDV, TPZ	2017-2019
2.18	The development of new models and individualization in continuing education	MPSV, MSMT	GR UP, NUV, FDV, TPZ	2017-2019
Creating platforms - support for tripartite dialogue on continuing training at national and regional level				
2.19	Tripartite dialogue should promote further education	MPSV	MSMT, trade unions, TPZ	2017-2018
2.20	Connecting regional actors in the field of education	MPSV	MSMT, GR UP, TPZ, KU, trade unions, employer	2017-2018
Setting the labor market conditions in a context of technological changes				
Methodical approach to monitoring the impact of technological change on the labor market				
2.21	Regular processing sector and thematic prediction and refinement in order to estimate the possible development brings opportunities and threats to creation of new jobs	MPSV	NVF, VÚPSV, TPZ	2017-2019
2.22	Creating conditions for the participation of representatives of employers and employees to impact assessment process technology trends to changes in the structure of professions and their contents	MPSV	NVF, VÚPSV, TPZ	2017-2019
2.23	Taking into account the new requirements of the labor market associated with the development of digital technologies in the National Occupational central database and competencies	MPSV	FDV	2017-2019
Systematic support for labor market adaptation to technological change				
2.24	Prevent long-term unemployment and the creation of a new bridge labor market for disadvantaged groups	GR UP	MPSV, TPZ	2017-2019
2.25	Support for self-employment and start small business	MPSV, MPO	GR UP, MF, TPZ	2017-2018

2.26	Research and preparation of possible solutions in the field of tax and insurance system, and the conditions under which those systems would have to cope with a reduction in the fiscal burden on labor income, and the requirements for the extension of employment opportunities in public services	MPSV	MF, employer, trade unions.	2017-2018
Changing labor market conditions in a context of technological changes				
2.27	Definition and labor regulation in relation to shared economy	MPSV	MPO, MF	2017-2018
2.28	Support for older and low-skilled persons and limitations of gender segregation labor market	MPSV	GR UP	2017-2019
Control of the impact of technological change on the social aspects				
Socio-economic impacts of technological change				
2.29	Analysis of the socio-economic impacts technological changes	MPSV		2017-2018
2.30	Changes in the social and pension scheme	MPSV	MF	2017-2019
The issue of compliance work and family life				
2.31	Creating the conditions for increasing labor market flexibility	MPSV	GR UP, FDV, employers, unions	2017-2019
2.32	Monitoring and evaluating the impact of telework on the reconciliation of family and working life	MPSV	Employers, unions, FDV	2017
#3 eGOVERNMENT				
Standardization, evaluation and improvement of accessibility and transparency of public administration through the instruments of eGovernment				
3.1	Selecting agendas to draw up a procedural description / model, model creation, evaluation and cost-benefit methods for modeled agendas	MV		2020+
3.2	Standardization of selected agendas	MV		2020+
3.3	Adjustment system of evaluation and measurement	MV		2018
3.4	Methodology of data collection	MV		4Q 2017
3.5	Implementation of the proposed solution	MV		2020

3.6	Evaluation of the use of digital tools within the ministries and other central government authorities	MV, coordinator, ministries, central state administration bodies		4Q 2017
Increasing the availability and transparency of public administration through tools eGovernment				
3.7	Build citizen portal, as part of the transaction Public Administration Portal	MV		2Q 2018
3.8	Another phase of the classification of online government services and the consequent expansion of online mapping services to the level of government	MV	Coordinator, ministries, government bodies, cooperation: partners from the private sector	3Q - 4Q 2017
3.9	Preparation of eGovernment cloud Republic	MV		4Q 2017
3.10	National architectural plan of eGovernment	MV		continuously
3.11	Preparation for full electronic filing	MV		4Q 2018
3.12	Anchoring electronic identity	MV		3Q 2018
3.13	ID cards with electronic chip MV			3Q 2018
3.14	Cross-border electronic identification	MV		2016 - 2018
3.15	Electronic invoicing	MV, MF		2016 - 2019
3.16	The legislative framework for accessibility	MV		4Q 2018
3.17	Analysis of the accessibility of public administration services for disabled	MV		4Q 2017
3.18	Project e-Collection and e-Legislation	MV, MSp		2020
3.19	Activities related to the computerization of public administration within the Ministry MF	MF		Continuously in 4Q 2020
Promoting the principle of Open Data				
3.20	National catalog of open data	MV		3Q 2018
3.21	Replacing the open data architecture within the context of the National Plan	MV		2Q 2018
3.22	Build and lead a working group of providers of open data at the level of ministries and central government bodies	MV		2Q 2017
23.3	Linked Data	MV		2Q 2018

3.24	Awareness of accessibility	MV		continuously
eHealth				
3.25	Progress in the implementation of the Strategy by the Action Plan for the National Strategy for eHealth Czech Republic for the period 2016 - 2020	MZd		2017- 2020
3.26	Launch a coordination center for management development of computerization	MZd		2017
3.27	Create the architecture of the current and future state of key projects for the development of computerization	MZd		4Q 2017 -
3.28	Implement key projects / building elements computerization	MZd		2016- 2020
3.29	Prepare measures to eliminate barriers to implementation	MZd		2016- 2020
electronic sick note				
3.30	Launch Electronic Medical information	MPSV		4Q 2019
3.31	Electronic provision of information on temporary incapacity	MPSV		4Q 2019
Electronization social services				
3.32	Setting the digital environment in the area of registration of social services	MPSV		4Q 2018
3.33	Support for the implementation of the digitization process in social services, support will be both methodical and by preparing the challenges of the European Funds	MPSV		continuously
3.34	Development of the Information System for monitoring social phenomena	MPSV		4Q 2020
3.35	Departmental portal labor and social affairs with client services in the social field	MPSV		4Q 2019
3.36	Starting the electronic exchange of data in the social sector in the EU (AP)	MPSV		4Q 2017
3.37	Analysis of possible support services of assistive technologies by the state	MPSV		4Q 2017
e-justice				

3.38	Individual circuits planned measures	MSp		4Q 2020
Electronization tax administration: activities coordinated by the Ministry of Finance (MF)				
3.39	Build an information system that will meet the conditions of tax administration, both from the perspective of taxpayers (clients) and financial management (as service providers) and other public authorities	MF		4Q 2021
3.40	The implementation of the principles of full electronic submission	MF		4Q 2018
3.41	Self-assessment: Preparation of final articulated version of individual tax code	MF		3Q 2017
3.42	Self-assess: Implementation	MF		1Q 2019
Smart Cities				
3.43	Methodological support to facilitate the implementation of Smart Cities	MMR, MV, MD		continuously
3.44	The Working Group on Smart Cities	MMR		continuously
3.45	The pilot project Smart City / Smart Region	MMR		4Q 2020 continuously
Support strategic management and planning				
3.46	The development and use of database strategy	MMR		4Q 2020 continuously
#4. SECURITY				
cyber security				
4.1	Creating a mechanism of cooperation at national level between the different actors cybersecurity (workplace type CERT and CSIRT) and strengthen their existing structures. Support of other workplaces type CERT and CSIRT in Czech Republic	NÚKIB		continuously
4.2	Training of civil servants in the field of cyber security and identify next steps	MV, NÚKIB		4Q 2017

4.3	GovCERT providing services to public institutions, operators of critical information infrastructure and basic services operators of systems to prevent and manage incidents, including cyber forensics and network analysis, monitoring changes in hidden web site content and external penetration tests	NÚKIB		continuously
4.4	Increasing network integrity of critical information infrastructure	NÚKIB		continuously
4.5	Collaboration with the private sector	NÚKIB		continuously
4.6	Education of the public and human capital development	NÚKIB		continuously
4.7	Transposition of the European Directive on the security of networks and information systems (ie. The directive NIS) - the creation and amendment of the relevant implementing legislation	NÚKIB		2017-1Q 3Q 2018
Protection of personal data				
4.8	Preparation of major legislative changes in connection with the general regulation on personal data protection force	MV		August 2017 to initiate inter-ministerial consultation process, 3Q 2017 to submit a proposal to the Government
4.9	The plan for preparing the state administration for the entry into force of the General Regulation	MV		3Q 2017
4.10	Cooperation with the private sector and non-governmental organizations in raising awareness of the general regulation on the protection of personal data	MV		continuously
4.11	Communication campaign to raise awareness about privacy, GDPR and preparedness him among companies, governments and citizens	ÚOOÚ	Coordinator	continuously (as required by the end of the year 2018)
4.12	Coordination working group on the protection of privacy and personal data	Coordinators, OPPD, MPO	MV	continuously (as required in the second quarter 2018)
#5. INDUSTRY, BUSINESS AND COMPETITIVENESS				

Industry 4.0				
Priorities identified by the Committee of Industry 4.0: • The preparation of specific topics of research and development (R & D), which is reflected in the updated national research and innovation strategy for smart specialization Czech Republic ("RIS3 Strategy") • Quality rule-making and legislative process as a whole, according to new principles • Updating the implementation plan of Intelligent Transport Systems (ITS) • eGovernment Cloud • Digital Strategy Education 2020 • Implementation of the National Development Plan next generation networks • Withdrawal of funds from the Operational Program Enterprise and Innovation for Competitiveness (OPPIK) - New Challenges Technology - Industry 4.0 • The measures of the Action Plan Work 4.0 • Implementation Strategy digital literacy of the Czech Republic for the period 2015-2020 and the follow-up Action Plan Strategy digital literacy of the Czech Republic for the period 2015-2020 (including continuing education and retraining) • The concept of Smart Cities				
Promoting investment				
5.1	Support innovative digital projects including start-ups	MPO		continuously
5.2	Investment Incentives	MPO		continuously
5.3	Support for innovative solutions	MPO		4Q 2020
Energetics				
5.4	The National Action Plan for smart grid activities and platform discussion for this area	MPO		continuously
Research, Development and Innovation				
5.5	Update RIS3 strategy following the concretization of topics relevant to the research, development and innovation in connection with the issue of the fourth industrial revolution	UV - MPR		4Q 2018
5.6	An evaluation of research organizations in terms of content and quality of research methodologies by 17+	UV - MPR		2017 and 2018
Automotive				
5.7	Memorandum handle on the future of the automotive industry in the Czech Republic, along with the Action Plan	MPO		September 2017
shared economy				
5.8	To submit a comprehensive document to the Government for consideration of further steps	Coordinators		august 2017

5.9	Participation in the debate at national and European level	Coordinators , MPO		continuously
online platform				
5.10	Monitor the activities of the European Commission in the field of online platforms	MPO	MK, Office Coordinator	continuously
E-Commerce				
5.11	Discussion Platform Office of the Government to the barriers and challenges Czech eCommerce	coordinator	, MPO, enterprise	continuously
5.12	Coordination of activities and opinions of individual national coordinators in the field of e-commerce	coordinator	enterprise	continuously
Construction 4.0				
5.13	Construction 4.0 Initiative	MPO	Other central government agencies secotr associations, unions	2019
5.14	Digitization construction through BIM	MPO	Other central government agencies secotr associations, unions	continuously
5.15	Computerization of the construction permitting process using BIM	MMR	MPO, others	following the new regulation of public construction law

4. Digitising European Industry (DEI) Pilar 2 - Standardization actions, regulation and testbeds

In the Czech Republic, standardisation is in the purview of the Czech Office for Standards, Metrology and Testing (Úřad pro technickou normalizaci, metrologii a státní zkušebnictví – "ÚNMZ").

Standardisation and the related technical regulations for Industry 4.0 aim at not creating new special standards for each element of Industry 4.0 – that is the job of each sector – but will focus on interoperability of the various elements. The aim is not to create a "Czech standard", but to be included in the European and global process of adopting such standards .

Standardisation is one of the few areas where the Czech Republic can contribute to creating a single, global Industry 4.0 concept. In practice, the majority of standards will be created by big multinational companies, but on the State level, the Czech Republic can become involved in approving and formalising these standards. The Czech Republic has a sufficient number of experts for this; they, however, will have to undergo regular training in this. Průmysl 4.0 initiative proposes that a body be created under ÚNMZ to coordinate the creation and revision of technical standards with regard to the needs of Industry 4.0.

The Průmysl 4.0 standardisation vision puts particular attention into data-driven services and intersectoral topic is ICT services. This topic is influenced by big data and machine processing of certain types of such data, which, for the reason of optimisation in production, will have to be standardised in data structures. The storage thereof in data centres is an important part of Industry 4.0. The threat of destruction, loss, misuse or theft of such data is an extremely important issue. At this time, some standards have been defined for data centres.

The Czech Republic build on a complex regulatory framework that carries on the tradition of its legal predecessors – from the first Czechoslovak Republic, through the war-time Protectorate of Bohemia and Moravia, then the Czechoslovak Socialist Republic to the Czech and Slovak Federative Republic. The composition of its legal code reflects this – it adopted the legislation of its predecessors, with many of them still in force as remnants of a bygone era: since 1918 an estimated 60 000 legal regulations, i.e. acts, decrees and government orders, have been issued within the territory of the Czech Republic. Another 10 000 regulations were taken on from Austria-Hungary in 1918, many of which were never even documented. According to estimates, there are currently around 15 000 regulations in force in the Czech Republic. It is very difficult to do business in such a confused legal environment and implementation. Therefore, as far as the situation in the Czech Republic goes, a possible disadvantage for implementation of Industry 4.0 is the fact that there is no comprehensive national digital strategy and the existing strategic documents are not sufficiently interlinked. Průmysl 4.0 demands a more accessible legal framework that creates no barriers for interoperability and business development and the access to a more integrated framework.

In September 2017, the Czech Government released the **Principles for Creating Digitized Legislation**, in connection with the Digital Agenda. The basis of the document is ten principles that are helpful to all who are involved in making or evaluating legislation. Approximately two dozen questions are attached to the policy attachment, and the answer will be to adhere to the principles. This is the first

comprehensive tool for legislators, but also for policy-makers in individual ministries, ICT architects and, last but not least, for law-makers. Both documents were created in cooperation with the Digital Coordinator of the Czech Republic and the Section of the Legislative Council of the Government. The package is key to understand the general principles applied for the development of smart regulation for digital transformation and therefore the development of advanced Industry 4.0 in the Czech Republic. From the two main areas of analysis we will focus on the digital agenda domain, which is of direct impact to DEI policy development. E-government dimensions are briefly addressed but not thoroughly discussed. **The interested reader is referred to the specific reference document for further information.**

The 10 principles derive from the fact that currently in a number of laws there are still many obstacles relating to computerization and digitization. This is particularly relevant in the agenda of public administration, but also in areas concerning cooperation of public administration with the commercial sector. The aim is to create legislation that is gradually eliminating such barriers. It is therefore to gradually adapt the Czech Republic legislation to both European and global trends in the area of digitalisation and computerization in many fields; but also enable the development of electronic services and to promote the digital agenda itself.

These principles are established in accordance with the strategic goals of the Czech Republic in terms of efficiency and the development of the public administration, the development of eGovernment and a digital agenda. The document is mainly based on two key strategies, namely the "Strategic Framework for Development of Public Administration for the period 2014 - 2020" (creation of legislation) and "Development Strategy for ICT services of the public administration" (the objectives and specifies general principles and the issues to be submitted new legislation to control). Furthermore there is a link to the National eGovernment architectural plan of the Czech Republic, where the document respects the principles of the GEA and distributes them to the general principles which create and amend legislation that will be in accordance with national architecture and will be implemented in practice. Document and principles contained therein are in accordance with the prepared documents and their principles, e.g. A future "National Information Policy of the CR" (compliance with the objectives of the legislation informational concept).

In addition to the general principles relating to the legislation as such (clarity of the rule of law, clarity, appropriateness, etc.), there are also principles which can be considered as key to meeting the needs of the development of the digital agenda.

In the digital agenda it is considered:

- Internet connection to provide access the widest possible range of subjects;
- guarantee the provision of similar services for clients of public administration throughout the Czech Republic;
- observe the principles of equality and accessibility of services for people with special needs, especially for people with disabilities and tailored to their needs and requirements for technical accessibility;
- electronically accessible consolidated form of legislation, thereby improving access to information about the legal system and the rights and obligations.

- respect technology neutrality and to choose the optimal combination of appropriate technological solutions;
- encourage innovation and private sector investment in ICT and to ensure the protection of existing private investment;
- preserve free markets, fair competition and prevent the creation of conditions for illegal state aid;
- enhance cyber security, while respecting the legal restrictions regarding the possibility of interference with privacy rights and freedoms;
- maintain the right to privacy where the law does not prevent the exercise of public authority or limit the rights and obligations of other entities;
- make information public administrations through open data for further development of services, products and innovations;
- strengthen digital and information literacy.

In the area of e-government:

- utilize to the maximum extent the existing principles and systems of eGovernment, such as basic registers and data boxes eGovernment Service Bus;
- follow multichannel principle - the law must respect the client's right to choose whether communicates personally with the State, in paper form or digitally, or a combination of these channels, except when the nature of things as follows. Personal interaction (summons);
- shortening the deadlines under management for public authorities, where it is with respect to the subject possible and expedient;
- Internal communication and functioning of public administration always prefer electronic communication and digital performance activities;
- Development of eGovernment always make the effort to streamline and optimize the scope of public administration and the use of ICT permanently reduce the administrative burden on businesses, clients and the public administration itself;
- attractiveness of electronic services to achieve growth in the use of electronic communication at the expense of traditional methods of documentary and attendance;
- strengthen networking guaranteed performance data for the agendas of public administration;
- electronically and simple way to access information about how complex life situations and raise awareness for clients;
- change eGovernment services by attending to elementary services to complex sub-section called. multiagendovým services, enabling self-service and assisted way to resolve the situation of the client;
- effectively interconnect data fund governance and enable the exchange of supervised data between information systems of public administration so that these data may not always be presented;
- build effective and truly usable electronic services based on trusted electronic identity and electronic identification of people and communication via electronic channels;
- propose legislation using national models of architecture, including the future architecture of the authorities in the affected area, its processes and IT support, thus ensuring better

alignment of the rules, their effective support for IT solutions and consequently faster and cheaper to implement transformational change;

- shift the perception and mindset of the public administration that the service is a service of public administration authority (official) client to facilitate the fulfillment of its obligation (liability) or the achievement of its claim (right) against public administration;
- in the design of public administration and legislation utmost account of the needs of the client.

The 10 principles driving smart regulation are as follows:

1. **Construction preferably digital services (principle "digital by default").** The target is to build all the services so that they can be implemented primarily in electronic form and that, in particular, for the internal functioning of the public administration, the electronic form of mandatorily preferred way to increase efficiency.
2. **The maximum repeatability and reusability of data and services (principle "only once").** The target is to use information held by public administration so that it may be collected and recorded for their active (re)use. Build services so that they can be re-used for other agendas in public administration.
3. **Building services accessible and useful to all, including persons with disabilities (the principle of "governance accessibility").** The target is that there will be no discrimination against persons with disabilities. Systems and government services for them will be completely accessible by default.
4. **Shared government services.** The target is to leverage legislation to ensure shared services allowing their use for public administration and other entities.
5. **Consolidation and interconnection of information systems in public administration.** The target is to leverage well, clearly described information systems (incl. their purpose and roles of individual entities). Ensure obligation or option to connect PAIS in order to fulfil the principles of repeatability and reduce the burden on the client, on the contrary, increase the efficiency of public administration.
6. **International Interoperability - building services connectivity and usable within the European area.** The target is to adapt legislation to the requirements of international interoperability and meet the obligations of the data exchange between the EU Member States and promote the use of electronic identification and trust services under Regulation eIDAS.
7. **Privacy extension to enable quality of service (principle GDPR).** The objective is to ensure effective and transparent linking of data resources of public authorities. At the same time ensure full control rights on use of data by data owners concerned.
8. **Openness and transparency, including open data and services (the principle of open government).** The target is to provide legislation to ensure openness to the maximum extent possible, yet ensure the protection of personal data and privacy. Operate an open state services usable without any restriction and publish open data.
9. **Technological neutrality.** The target is not to create artificial barriers limiting the technological neutrality; as opposed to the use of any technical and technological means to restrict the use of specific technologies or even suppliers.

10. **User friendliness.** The target is to leverage legislation to promote the universality and restrict specific user barriers. Also think about the clarity and usability of the digital product as such.

5. Digitising European Industry (DEI) Pillar 3 - Digital Innovation Hubs actions

The Průmysl 4.0 initiative introduces a clear vision towards the research and innovation infrastructures that serve Industry 4.0 digital transformation. Průmysl 4.0 address a revision of organisational structure of **National Application Oriented Research Centres for Industry 4.0** on the orientation and definition of the scope of activities of the various centres on the national level. Such innovation infrastructure play a role in lowering the acceptance barriers of Industry 4.0 through specific awareness campaigns and innovation support services. Moreover, this network will become a reference for the development of innovative research and innovation projects with a clear market impact. Therefore, National research centres, being system infrastructure, will be methodologically managed by a managing board that coordinates their funding and activities. The majority of the managing board comprise key industrial companies.

The research environment under Průmysl 4.0 is to be fundamentally revamped so as to create an arterial network of National Centres focused on selected key tasks, financed in part institutionally but predominantly from industry funding.

In this network, it will be possible to gradually build up a system of experimental pilot plants or parts thereof (testbeds) serving to develop and test Industry 4.0 ideas and algorithms under semi-real conditions. This will plant the seeds for small and medium enterprises to be able to utilise the results of research without having to finance prohibitively expense research in the field of Industry 4.0.

The network of National Centres will also serve large global companies and their R&D units in the Czech Republic. The Industry 4.0 initiative is also a major invitation for applied social science research, the results of which are key to help all of society absorb the ideas of Industry 4.0 in an attempt to avoid turbulence on the labour market and to create new job opportunities.

6. Digitising European Industry (DEI) Pilar 4 - Skills development.

In the area of supporting development of the labour market, the European Union is guided by its strategy "New Skills for New Jobs", which the European Commission put out back in 2008. Its aim is above all to help better forecast which skills will be needed on the labour market, to develop and adapt teaching and training of skills to meet the needs of the labour market and to bridge the gap between the education sector and the labour market.

The Czech Republic has its own national strategic document for the development of digital skills of employees, called the "Digital Literacy Strategy for 2015–2020"li, for which an implementing document is currently being drawn up - the "Action Plan for Implementation of the Employment Policy Strategy to 2020"lii which, however, does not reflect the future developments associated with implementation of Industry 4.0 in its current form.

An extremely important area in connection with implementation of Industry 4.0 will be the prediction of future labour market needs and focusing the fields and content of education on "professions of the future" or "positions for Industry 4.0". This is also to be matched with the opportunities for employability in the Czech and European labour market. The way does not however lead so much through legislative measures as by more deeply tying the composition of fields of study and the content thereof to the needs of practice, intensifying cooperation between schools and businesses in mutual exchange of information and experiences and providing technical equipment and work placements with the goal of increasing the likelihood of graduates finding work. Therefore, Průmysl 4.0 puts special attention to respond appropriately in the field of lifelong education, labour market policy, social policy, and other areas.

From a policy perspective Průmysl 4.0 employment policy reacts to the processes of workforce being let go as a result of automation and ICT in two ways. For one thing it will be necessary to support demand for labour and creation of new jobs through the fact that the overall costs for labour will be reduced. The path to reducing labour costs is lowering the tax wedge, meaning reducing taxation on wages and quasi-fiscal charges, i.e. social security and other insurance payments.

Furthermore, it will be necessary for the employment policy to provide much more intensive support for flexible pursuit of new jobs, to provide for retraining and continuous development of human capital and to create a flexible environment on the labour market. Increasing demands will be placed on the state to add socially motivated jobs, particularly to offer first work opportunities to those just entering the labour market. Analysis also focuses on the possibilities for new utilisation of workers let go from other sectors in the field of services where the societal need has not yet been saturated, such as social services, healthcare, education, recreational services and increasing quality of life, environmental protection, etc.

The Czech Republic adopted the Strategy for Digital Education in 2020 (MoE, 2014) and the Strategy of digital literacy of the Czech Republic for the period 2015-2020 (MPSV, 2015). In terms of education, the objectives are to develop digital literacy and computer science students thinking, improve their competence to work with digital technologies and introduce new methods of learning and reformulate the framework educational programs to better meet the new methods and ways of learning through digital technology. The main objective of the Strategy of Digital Literacy of the Czech

Republic is to support and provide solutions based on the cooperation of relevant coordinators that lead to the development of digital skills for all citizens.

In the context of the fourth industrial revolution and in connection with the foregoing Initiative Works 4.0 (MSMT) and Education 4.0 (responsibility of the Ministry of Education) the Society 4.0 Action plan proposes 35 specific measures

7. Specific National Measures.

The Czech Republic Ranks 9th in the PWC study for Digital Tax Index 2017: Locational Tax Attractiveness for Digital Business Models. As part of the strategic analysis for the definition of the Průmysl 4.0 initiative, a number of instruments to deal with the capital intensive aspects of implementation of industry 4.0 actions, systems and process has also been considered.

OP PIK is one of the ley financial instrument to support the implementation of Průmysl 4.0 national initiative. The programmes already in place can be used the following manner; not precluding the development of dedicated programmes for Industry 4.0 solutions and process development:

- **"Technology - Industry 4.0".** The oncoming so-called Fourth Industrial Revolution triggered a need for strengthening and supporting the implementation of the technologies and technology solutions that will help boost the international competitiveness of enterprises. The Ministry of Industry and Trade has been preparing a new call for the OP PIK (Operational Program Enterprise and Innovation for Competitiveness) "Technology - Industry 4.0" aimed at increasing the digital level and accelerating the digital transformation of small and medium-sized enterprises (SMEs). A call is being prepared in cooperation with the Committee Industry 4.0, the Department of Cybernetics of the Czech Technical University and the Confederation of Industry of the Czech Republic. When assessing the eligibility of applicants, the level of digital transformation according to the fundamental elements defining the Industry 4.0 will be taken into account (Big Data, Enhanced Reality, Data Integration, Internet of Things and Services, Digital Twins, Communication Infrastructure).
- **Application.** The goal of the Application programme is to support industrial research and experimental development leading to introduction of **higher-scale innovations** and creation of internationally **competitive products**. The programme supports projects with amounts ranging from CZK 1 - 100 million (up to 3,8 M€). The amount of the subsidy differs according to the type of research and company size. The maximum level of support for a whole project is limited to 70%.
- **Potential**. The Potential programme supports investment in a quality corporate base for realising industrial research. Projects are aimed at stimulating activities that deepen cooperation between companies and research and development organisations. A subsidy of CZK 2 - 150 million (up to 5,75 M€) can be obtained for a single project prototypes as part of industrial research, research workshops, and lab equipment incl. CAD, CAM, simulation and hardware for industrial research.
- **Innovation Vouchers** The objective of the programme is to provide enterprises with the means to purchase expert know-how that will help the rapid development of their business. The subsidy is intended for businesses, groups of companies, state or local government bodies, organisations for research and the dissemination of knowledge, as well as for non-profit organisations. One project can receive a subsidy ranging from CZK 80 to 500 thousand (up to 20 K€), which covers external services provided by an organisation for research and dissemination of knowledge or for staff costs and selected operating costs of an operator of innovation infrastructure.

- **Infrastructure Services.** The Infrastructure Services programme supports cooperation projects between entrepreneurs and research organisations. Investments go into the development of science and technology parks, innovation centres and incubators.
- **Cooperation.** The goal of the programme is to develop innovation networks – clusters, technological platforms and other types of cooperation networks. It is a tool for increasing the intensity of joint research, development and innovation activities among commercial entities and the research sector. Also supported is cluster internationalisation - establishing cooperation within the European Research Area, getting involved in cross-border networks of excellent clusters (with emphasis on future challenges and key technologies), coordinated access to third markets, etc. Support is provided in the form of a subsidy of CZK 0.5 M – 16 M (up to 600 K€).
- **Knowledge Transfer Partnership.** The objective of this programme is to support cooperation between SMEs and research organisations. Subsidies under this programme are intended for businesses, groups of businesses and organisations for research and dissemination of knowledge, such as state and local government bodies, research organisations and non-profits. A single project can obtain a subsidy of CZK 0.5 - 3.5 million (up to 135 K€).
- **Pre-Commercial Public Procurement.** This programme is used primarily by the public sector which, thanks to it, can reduce the risk of inefficient public procurement. The programme finances the development of innovative solutions, thus the subsidies also apply to the research and development activities of companies, which can thus invest in products and services in which the public sector will truly take an interest.
- **Proof of Concept.** This serves to "test a concept" in the sense of testing the commercial potential of the results of research and development. It is primarily additional research with additional funding requirements. Patent protection, financial consulting, networking, etc. are generally be funded under the activity of technology transfer workplaces. Subsidies can go to business entities (especially SMEs) and research organisations.
- **ICT and Shared Services.** The goal of the programme is to support all types of business entities that focus on software development, run data centres or create shared service centres. The supported activities are creating modern and advanced digital services and applications, setting up and running shared service centres and building and modernising data centres.
- **High-Speed Internet.** The objective of this programme is modernising and expanding infrastructure for high-speed internet access, particularly covering "blind spots", where there is currently no coverage. The expected support activities are modernisation or expansion of existing infrastructure for broadband internet access using optical elements, setting up new networks made up of partially or fully optic lines for high-speed internet access that allows for a high transmission speed, and creating passive infrastructure for helping build broadband internet networks, especially in areas of expected future development.

The national initiative also considers additional financial instruments to attract external investment in the country and in the implementation of Industry 4.0 supported by the technology enablers identified by Průmysl 4.0 initiative. The Průmysl 4.0 also considers the application and revision of the following financial instruments:

- **National Innovation Fund.** The Ministry of Industry and Trade is also preparing a National Innovation Fund (NIF) subsidised with CZK 1.3 billion (49 M€) with the following parameters: the basic vision of the NIF project is activating the venture capital market, helping boost the spirit of enterprise in the Czech Republic. The essence of the NIF is implementing state aid instruments in the form of capital inputs, both into own capital (equity) and using other forms of financing such as convertible loans, mezzanine financing, etc. (quasi-equity).
- **Act on Investment Incentives.** The existing Act on Investment Incentives makes it possible to support quality projects that are compatible with the direction of Industry 4.0. Investors from the manufacturing industry, strategic services and technological centres, both newcomers and existing ones, can get 10 years of income tax relief.
  Another form of support is a strategic investment projects. This means that, in addition to standard investment incentives, projects marked as strategic investments can acquire material support for capital investments of up to 5% of the costs.
- **Trio.** The Trio programme is run by the Ministry of Industry and Trade and, with an expected allocation of CZK 3.7 billion (141 M€), supports applied research and experimental development. Its aim is to increase the use of research and development results in technologies used in the business sector. The programme also endeavours to increase cooperation between businesses and research organisations. The support areas relevant for Industry 4.0 are photonics, micro- and nanoelectronics, nanotechnology, advanced materials and advanced manufacturing technology.
- **Gama.** This programme aims to support and streamline the transformation of research and development results into practice. Research organisations and businesses have access to the subsidies. The main objective of the programme is to support and streamline the transformation of research and development results that research organisations have come to – either on their own or in cooperation with companies.
- **Epsilon** This programme aims to support applied research and experimental development.

With respect to education and preparing human resources the national initiative considers the following programmes:

- **Operational Programme Research, Development and Education** Operational Programme Research, Development and Education (OP VVV) gives the Ministry of Education the opportunity to rationally distribute a total of CZK 75 billion (2,8 B€). Of primary relevance for the needs of Industry 4.0 are the priority axes
  - PO1: Strengthening capacities for high-quality research, focused on helping Czech research achieve excellence of an international scale, and
  - PO2: Development of universities and human resources for research and development,
  - as well as part of PO3, in particular under specific objective 2: Improving the quality of education and student results in key competencies, and specific objective 5: Improving the quality of education and professional training, including strengthening their relevance for the labour market.
- **Operational Programme Employment.** Operational Programme Employment (OP Z) under the Ministry of Labour and Social Affairs aims to improve the human capital of the population

and public administration in the Czech Republic, the adaptability of employees and employers, and of continuing education, which are all parameters needed for the Industry 4.0 concept and which are focused primarily under

- Priority Axis 1: Supporting employment and workforce adaptability. The total allocation for OP Z is approximately CZK 70 billion (2,68 B€).

From the above perspective it is clear that there are vast resources available, but they must be conceptually cast in the desired direction and the proportion of those resources that will contribute to the Průmysl 4.0 implementation are yet to be determined as the Společnosti 4.0 Plan is implemented.

8. Investments for Digitising European Industry.

The national initiative has identified a number of programmes and financial instruments that can support the implementation of the national initiative. OP PIK would seem to be a key instrument for getting Industry 4.0 applications rolling in the coming years. The opportunities and implications of Industry 4.0 must be incorporated into the Innovation Platforms of the RIS3 strategy and then into the calls for submissions under the operational programmes that tie in to the RIS3 strategy. Aside from the programmes of Application, Innovation, Cooperation, ICT and Shared Services and High-Speed Internet, which can be used at least partially for the needs of Industry 4.0, the national initiative is considering creating a separate programme under OP PIK entitled Industry 4.0.

Financial demands of programmes to deal with the educational system or the requalification of labour, and changes to the labour market would fit under the OP VVV and OP Z.

In terms of budget available to meet the needs of Průmysl 4.0 initiative, the abovementioned operational programmes are already resourced through national and structural funds. In particular. An important instrument that already exists are the programmes of the Technology Agency Beta (fulfilling the research needs of ministries, still far below its estimated absorption capacity of CZK 3.2 billion – 122 M€) and Omega, for social science research (absorption capacity around CZK 7 billion – 268 M€).

OP PIK, with a total allocation of CZK 120 billion (4,5 B€), is to become a key financial instrument immediately available for kick-starting and applying Industry 4.0 in the current programming period. Programmes particularly appropriate here are Application, Potential, Innovation Vouchers, Infrastructure Services, Cooperation, Knowledge Transfer Partnership, Pre-Commercial Public Procurement, Proof of Concept, ICT and Shared Services and then High-Speed Internet, where the situation. However, Průmysl 4.0 demands the creation of a separate programme for Industry 4.0 focused on systems compatibility.

Digitising European Industry (DEI) Pillar	Action Lines (National Programe)	Total Investment (M€)
P1 - Digital Platforms (Infrastructures and R&I)	**Infrastructures**	**145 €**
	OP PKI High-Speed Internet	
	Platforms, R&I	**145 €**
	OP PKI Potential.	
	OP PIK Application	3,80 €
	TA Trio/Gama/Beta/Epsilon	141,00 €
P2 - Standardization actions, regulation and testbeds		
P3 - Digital Innovation Hubs		
	TA CR	
	OP PKI Infrastructures	
	OP PKI Cooperation	
P4 -Digital Skills Development		**5.748 €**
	OP VVV	2.800 €
	OP Z	2.680 €
	Omega	268 €
Investments & Enterprise Development		**49 €**
	Innovation Vouchers (PRŮMYSL 4.0)	
	OP PKI Knowledge Transfer Partnership (PRŮMYSL 4.0)	
	National Innovation Fund (NIF) (PRŮMYSL 4.0)	49 €