Strategy of the Digital Transformation of Slovakia 2030

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Strategy for transformation of Slovakia into a successful digital country

The Strategy of the Digital Transformation of Slovakia 2030

is a framework inter-departmental government strategy that defines the policy and particular priorities of Slovakia in the context of already on-going digital transformation of economy and society under the influence of innovative technologies and global megatrends of the digital era.

The Strategy of the Digital Transformation of Slovakia 2030

The Strategy represents a key and decisive document for Slovakia at the beginning of the 21st century at the time of necessary **transformation of industrial society to information society**. It covers the time period from 2019 to 2030 and it was prepared as part of already running and partially managed processes of digitalization, informatization and the agenda of the single digital market of the European Union (hereinafter only as the "EU"), as well as in the context of global priorities of the general digital transformation. Thus, the Strategy puts primary emphasis on latest innovative technologies such **Artificial Intelligence** (hereinafter also as the "AI")**, Internet of Things** (hereinafter also as the "IoT")**, 5G technology, big data and analytical data processing, blockchain and High-Performance Computing** (hereinafter only as the "HPC"), which will become the new driver of the economic growth and increase the competitiveness. At the national level, it is therefore necessary to accelerate already launched processes, interconnect national strategic measures with global trends as well as implement new policies that result from the latest cross-sectional priorities of the EU as well as from Slovak specific needs.

Digital transformation is bringing about not only a technological challenge but, primarily, a social challenge that affects all Slovak citizens. The target entity are **citizens**, whose everyday lives at work and in private should become simpler and acquire higher quality as well as citizens-entrepreneurs for whom the government's main effort is to reduce the paperwork burden as much as possible and support them with adequate incentives. Information and digital technologies must therefore be developed and used for the purposes of increasing the quality of lives of inhabitants and optimising their benefit for the **economic, social and environmental growth of the country with the focus on sustainable development**. Therefore, the strategic goal of the government is to take a conceptual approach to digitalization of the economy and society and apply the top level principle in order to significantly proceed towards the digital transformation.

The Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization (hereinafter only as the "ODPMII") as the central state administration body for informatization of the society, including preparation of single digital market policies is the principal strategy coordinator from the viewpoint of thematic and conceptual contents of their activities. The ODPMII, in coordination with other central state administration bodies, is in charge of preparation, setting priorities as well as implementation of the strategy. It is necessary to **correctly set regulatory as well as non-legislative measures**, which will launch digital transformation in the right direction and with direct positive impact on citizens and the business environment. Investments into digital economy can provide Slovakia with additional growth that is beyond the scope of original pillars of our economy. There have already been several significant initiatives launched for the purposes of informatization and digitalization of various fields of economy and society at different state administration bodies. **However, the ODPMII is fully aware of the need of their integration into the principal line of its own digital agenda as well as their transformation into particular measures "under one roof"**. That was the trigger for preparation of the strategy contained in this document.

Vision of the digital transformation of Slovakia

The Strategy is based on the creation of the new **multi-annual financial framework of the EU** for 2021-2027, including Cohesion policy instruments as well as directly managed programmes (including *Digital Europe*[1] and *Connected Europe Facility* – digital part[2]), where the need for development of the digital economy is paid special attention.

Along with the aforementioned, it also directly reflects conceptual documents and recommendations of international organisations, in particular, the Organisation for Economic Cooperation and Development (hereinafter only as the "OECD") and the United Nations Organisation (hereinafter only as the "UNO"), which **deem the process of digital transformation crucial for achieving sustainable and inclusive growth**. At the same time, the strategy was inspired by digital policies of advanced countries such as Finland, France, Singapore and the United Kingdom. The Strategy also analyses current starting point of Slovakia – in particular, specific priorities and the most urgent needs of the country, which were evaluated also on the basis of prestigious international indexes, including the *Report on Slovakia 2019* prepared by the European Commission (hereinafter only as the

"EC"). At the same time, the **Strategy respects and operates with already existing national strategies and action plans**, in particular referring to the Smart Industry Action Plan. All such findings were summarised and transformed into the vision of digital transformation of Slovakia with a list of recommendations for short-term and long-term horizon that will turn the vision into reality. It formed the basis for defining the digital transformation of Slovakia as follows:

> *By 2030, Slovakia will become a modern country with innovative and environment-friendly industry built on knowledge-based digital and data economy with effective public administration ensuring smart use of the territory and infrastructure and with an information society whose citizens use their potential at full and live high quality and safe lives in the digital era.*

Slovakia has a strong economic, geographic and human potential to implement this vision, however, it also has limited capacities, possibilities and resources to carry out this undoubtedly demanding process. Therefore, the approach to digital transformation of Slovakia requires a well elaborated systemic view. Based on that, we have identified the following **preconditions**, i.e. sources for digital transformation of economy and society:

Human capital

(educated labour force that can materialise and utilise possibilities of the digital era),

Infrastructure

(set of necessary technologies, solutions and systems),

Regulatory framework

(framework for defining legislative rules and means of operation). Based on the current starting position of Slovakia, the following **sectors** were designated as areas where ne necessarily need to multiply our potential by means of the digital transformation:

Economy

Society and Education

Public administration

Territorial development

Science, research and innovations

Anyway, it is necessary to understand the process of digital transformation of Slovakia in a broader context as a part of the comprehensive process of building the 21st century information society. **The final goal of the process of digital transformation and building of the information society will thus be setting preconditions for a satisfied and dignified life of every individual in the digital era in the context of respect to and the build-up of the digital humanism.**

Approach to the digital transformation of Slovakia

The task that is ahead of us is of extraordinarily complex nature and requires coordination of multiple stakeholders and a systemic approach that will be continuously developed at three levels:

1 Concepts and policies ensuring innovation in selected sectors and industries:

Policies and legislative frameworks will be regulated in such way to support the digital transformation either in the form of simplification, removal of obsolete rules or adoption of brand new concepts.
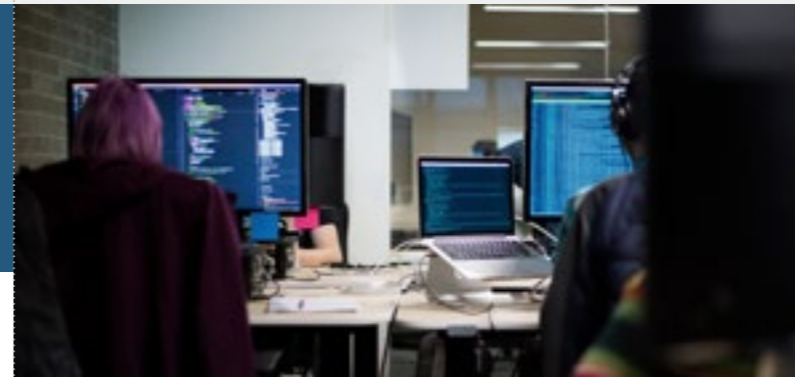
2 Innovation laboratories as a tool for experimenting with new means of performing public administration:

for selected sectors, there will be innovation laboratories set up in order to experiment with new policies, business models and technologies and assist in managing the procedure of the digital transformation.

3 New approach to projects:

A shift in the perception of the preparation of projects and focus not only on grants from Cohesion policy instrument but also on directly managed EU programmes.

It is an ambition of the Strategy to introduce a vision of the digital transformation of Slovakia, reconditions of its implementation and the priority areas of its implementation. **Therefore, the purpose of the Strategy is not to set particular measures** but rather define a vision that will form the basis for development of specific measures. A successful implementation of the visions as well as majority of its recommendations will require a broad political support beyond the scope of the current government mandate. The intention is to provide the background for the present as well as future Slovak governments. The vision of the Strategy is thus embodied into projected priority areas for **short-term (3Q/2019 – 2Q/2022)** and expected priority areas for **long-term horizon (3Q/2022 – 4Q/2030)**. The short-term horizon measures will form the core starting block for elaboration of the *Action plan of the digital transformation of Slovakia 2019-2022,* **which will be directly based on the presented Strategy**.

In the short-term horizon, there have been three projected and recommended priority areas set that will constitute the cornerstone of the *Action plan of the digital transformation of Slovakia 2019-2022. It entails the following priority areas:*

2019–2022

The digital transformation of schools and education for the purposes of increasing their quality, improving the preconditions for finding a job and acquiring competences necessary for the digital era,
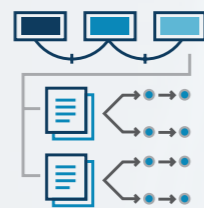
Creation of the basis for modern data and digital economy and for the digital transformation of the economy in general,
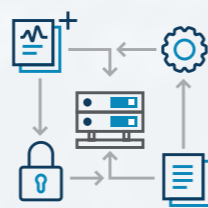
Improvement of the ability of the public administration to utilise data and innovations for the benefit of citizens.

In the **long-term term horizon**, the Strategy outlines expected priority areas that follow up and extend the short-term horizon areas. It includes the following ambitious goals whose implementation will necessarily require time and space for us to be able to grasp all building blocks of the Slovak success in the digital era:

A successful process of the digital transformation is the direct precondition of the country's global competitiveness. *The Strategy of the Digital Transformation of Slovakia 2030* sets out the vision of the digital transformation of Slovakia, as well as the means and sectors to transform the vision into reality by means of specified priority areas for short-term and long-term horizons.
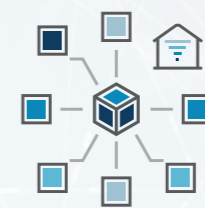
Innovation digital
and
data economy,

Educated, healthy
and
secure society,

Modern
and effective public
administration,

Smart
territorial
development,

High-quality science,
research and innovations
at the top level.

Economy:

Businesses are successful and can use and generate innovations

Economy, industry and labour market adjusted to the requirements of the digital era

Slovakia needs to set conditions for a continuous digital transformation of all economy sectors. It includes, above all, transformation of present-day industry to industry 4.0, which is used to refer to the current trend of digitalization and related automation of manufacturing and data exchange in production processes. Industry 4.0 will become the engine of the economic growth of the country. The goal is to utilise the potential and increase private and public investments to new technologies. Therefore, it will be necessary for the government to help businesses get prepared for such transformation. This preparation will, primarily, ensure that the government will provide access of businesses to knowledge and technologies as well as to stimuli and incentives for solution of specific problems, e.g. by means of digital innovation hubs.

Thanks to a continuous deployment of automated technologies, majority of industries will experience a shift in the nature of skills. When working with new technologies, workers must be able to take over complex, less automated tasks, such as solve problems, create their own solutions and approaches and apply critical thinking. Equally, cognitive skills, social skills, communication skills, organising, technological expertise as well as creativity are categories whose importance will constantly grow and they will be the most sought after ones in the labour market. The Slovak market will have to effectively accommodate to that.

Slovakia will also create preconditions for development of dynamic data economy. The legislative environment will be set in the manner that will enable application of new business models based on platforms and AI in practice. There will also be additional demand for innovative solutions in economy in order to create innovations. Slovak companies will thus employ a growing number of data analysts.

It was the economy of platforms that played a significant role in the dynamics of the global economy in the past few years. The list of fastest growing global brands is slowly being dominated by the new platform based business model – three of out five biggest companies in the world based on their market value (Apple, Google a Microsoft) have been actively utilising this business model. The platform represents a means of economic activity that enables external producers and consumer to effectively take part in creating a value. Such value can rest in sale of goods, provision of services or increase of the social status. The platform itself, however, usually does not own any resources for creating the value – for example a successful online platform Airbnb, which puts together providers of accommodation and tourists, owns no hotel. The online platform only provides a digital open and participative infrastructure (online portal) to enable such interactions and it also regulates them on the basis of its rules.[3] One of the keys to success of the European economy will lie in the development and creation of new European platforms as well as possibilities for business to effectively operate in the new type of the market (logistics platform, platform for automobiles and transport, platform for smart households, platform for smart industry, health care platform, etc.).

Businesses using innovations

Slovakia needs a business ecosystem that is capable of facing global competition and producing successful innovations. The technological progress and investments into infrastructure are made, above all, by multi-national companies operating in Slovakia, however, small and medium enterprises and start-ups contribute to a significant extent, too. For this reason, it is necessary for the government to support all such entities at the maximum possible level.

The digital transformation should provide business in Slovakia with:

- Unified and simplified processes for doing business all over the EU,

- Reduced transaction costs when providing content and services across borders (thanks to unified contractual rules and well set VAT tax mode),

- Regulations adjusted to the digital era that will support a fair economic competition, fix problems of digital monopolies and support innovative business models,

- Effective electronic communication with the public administration that will save businesses' time and money,

- Financing that will support innovations of businesses and state-supported "living labs", where they will be able to test innovative solutions in practice and further scale and improve them,

- New possibilities for utilisation and processing of data, including ensuring free movement of data as the fifth freedom of the EU internal market.

It is also possible to expect that the unification of rules in the EU will result in a significant increase of competition, which will be accompanied with many challenges and opportunities. In general, it is possible to assume that the companies that only those companies will be successful that can innovate and digitalise their processes and, in particular, offer services and products with high added value.

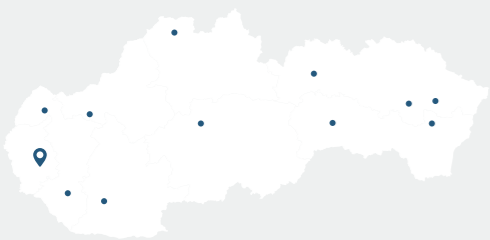# Robust, functioning and secure communication infrastructure

The digital transformation will only be possible in the case of existence of additional robust, secure and functioning communication infrastructure that will enable permanent interconnection of all systems, their mutual communication and, of course, their effective management and supervision. The build-up of electronic communications networks constitutes implementation of the policy of the country, the EU and the public interest. Therefore, it will be necessary to introduce transparency and unity into processes for granting permissions for construction and territorial planning, categorising structures that would enable simplifying the construction and modernisation with regard to peculiarities of such networks. It is necessary to set policies and positive regulatory approaches (meaning that we will regulate only what is necessary to increase the efficiency of its operation), which will help create conditions for accelerating investments into optic fibres and ensure coverage of the whole of Slovakia. Equally, it is necessary to set conditions for effective cooperation of telecommunications companies in the build-up of the infrastructure to prevent double parallel and independent coverage. It will be necessary to create an Atlas of passive infrastructure and ensure effective functioning of the Uniform information place, in particular, compliance with the rules by all stakeholders.

Smart transport

Slovakia is one of global leaders in automobile production. For several years, Slovakia has been the leader of the global rank in the number of cars manufactured per thousand inhabitants – it was 198 cars in 2018. In the rank of absolute number of produced vehicles, Slovakia ranked twentieth in 2018 with the production of slightly above 1 million cars per year.[4] However, with regard to Industry 4.0., Slovakia has to be not only a leader in the production but also in innovations and in transport. Introducing policies of smart transport, smart mobility and integrated public transport systems is a huge opportunity

Smart transport

for setting new companies focused on innovations and value added activities. Slovakia should establish the environment and preconditions for testing and successful deployment of smart public transport and autonomous mobility concepts into practice as part of its national transport infrastructure. Equally, Slovakia should take part in the C-Roads project.[5]

Progressive financial sector providing financial innovations

Digital innovations and technological progress are thoroughly transforming every aspect of operation of the financial sector. There is a radical change of the use and providing of products and services of banks, insurance companies and other related financial institutions. The development in the field of financial innovations is proceeding very quickly and therefore it is necessary for regulatory bodies to be in close contact with market players and innovative companies and to set favourable and dynamic conditions for the digital transformation of the Slovak financial sector. It is important to keep stability of the financial sector and adequate protection of financial consumers and, at the same time, keep such regulatory environment in Slovakia that will enable established as well as new financial institutions to apply progressive procedures and make full use of the potential of new technologies that will support the transition of the Slovak financial sector to the digital era.

Society:

Citizens and consumers are able to implement their potential in the digital era and their rights are protected
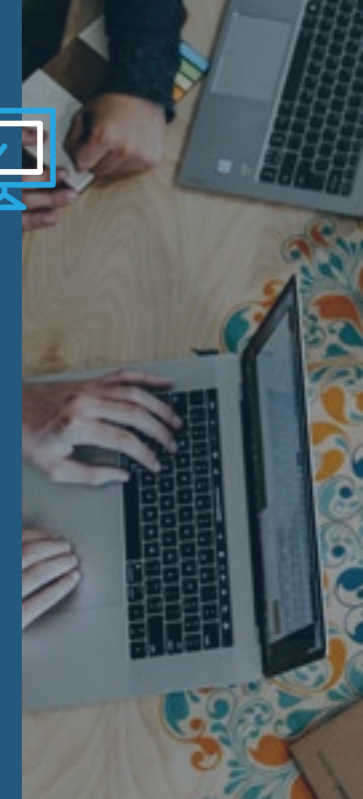
Modern and high quality education in order to build the information society

Slovakia needs a comprehensive systemic change of its education. The progress in the digital economy can be achieved only by means of improving the quality of education and developing skills of students, employees and consumers who can respond to new labour market challenges and accept technological innovations that will be appearing in an increasing pace. The purpose of the education at all levels of schools must be an overall development of the personality, development of the culture of relations as well as development of the ability to learn, deduce problems and acquire skills in a targeted manner as well as find one's way in extensive data of the digital world.

In the context of increasingly globalised labour markets, companies are competing for skills and qualifications necessary to support innovations. Investing into skills and qualifications can turn the digitalisation into net creator of jobs, it can support innovations, investments, productivity, growth and employment. World Economic Forum has warned that further significant changes in the global economy and in different societies will be even bigger and more serious than the recent ones. Therefore, it recommends governments all over the world to commence necessary reforms. It is necessary to start educating in fields of emotional intelligence, creative thinking and cooperation. Those three areas will be crucial in the process of transition to the information society.

Advanced and inclusive civil society

Information and communication technologies and innovations bring new opportunities for building a stronger and more inclusive civil society. Globally, there is huge effort made to use the potential of digital technologies in order to mobilise civic measures at local, national and international levels. Such effort also includes providing online access to high quality journalism – provided that the copyright is protected and there is compensation for professional journalistic work – civic activism at social networks, introducing elections over the Internet, etc. On the other hand, there are also negative effects that can impact digital technologies and standards and the nature of the public life, social cohesion and the level of democracy that are threatened by spared of disinformation and fake news on the Internet. Therefore, it is important to set the system of technology use in a way that will strengthen the civil society and democratic values and effectively fight any forms that would like to weaken them.

Then, all citizens will be able to get involved into life in the digital era and accommodate to new challenges:

01

Challenges

≫

Consumer swill have access to trustworthy and transparent digital services an digital content under the same terms in the entire EU;

02

Challenges

≫

They will be able to make full use of such services thanks to enhanced digital skills, regardless of their age or education – no one can be left out of the digital space and benefits it brings;

03

Challenges

≫

Citizens will understand the value of their personal data, they will learn how to protect them, manage and use them in order to get the maximum possible benefit. Thanks to the availability and the possibility to manage one's personal data can improve their health and better approach their financial matters. It is important for the government to make full effort in order to achieve progress in the field of cyber security and to make digital services secure and any data and infrastructure protected from misuse;

04

Challenges

≫

Thanks to a successful transformation of the industrial production, there will be a sufficient offer of high quality jobs – programmes for requalification and education of citizens will open brand new job opportunities that will increase the standard of living in Slovakia;

05

Challenges

≫

Thanks to their skills, citizens will have much broader and flexible possibilities of getting employed.

Fully Digitized
Innovation-Applying Healthcare

Health innovations, such as eHealth integrating all healthcare actors, new imaging methods, telemedicine, personal genomics or mobile health, have great potential to enable healthcare professionals delivering healthcare more effectively, in better quality, and more safely, and citizens to take control of their own health; improving the quality of healthcare, the level of public health and well-being of both, healthy citizens and patients.

Flexible and Innovative Social Policy

The digital age offers new opportunities to the socially disadvantaged, heavily disabled and dependent citizens for improving their daily lives. New technologies can make the life not only for socially and physically disadvantaged and dependent citizens, but also for their family members, more effective and improved. The aim is to create and ensure the conditions for independent and free life of all citizens dependent on the assistance of society in the natural social environment of the community. Social policy also needs to enable the platform economy workers to gain meaningful and flexible social insurance. Social and labour market policies will adapt to the new challenges of flexible employment so that every employee and entrepreneur is protected.

Cyber Security

Ensuring cyber security is a prerequisite for the successful functioning of each state in the digital era. For this reason, cooperation at a national level and between the public and private sectors and the academic community is needed. Also essential is the international cooperation, sharing best practices from abroad and, in particular, cyber diplomacy. For cooperation to work effectively, each partner needs to have adequate capacity to manage the concerned security risks, in regards to its role and tasks. It is therefore necessary for every organization, as well as individuals, to know the risks they face and to realize that in order not to become jeopardized, they will have to exert some effort, spend the funds, but also demonstrate the willingness to behave in a way that at least does not increase, but ideally shrinks, the security risks.

Public Administration:

Functional and modern public administration that can effectively manage territories from the national down to the local level
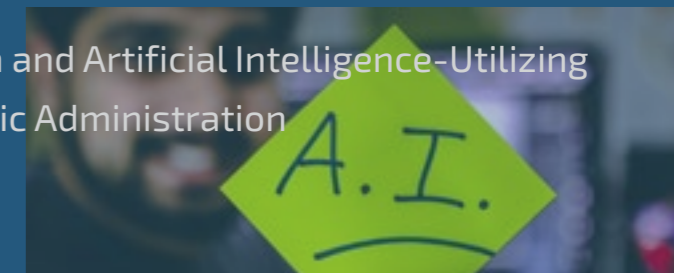
Public Administration that Innovates

Public Administration with Sufficient Capacity and Culture of Invention

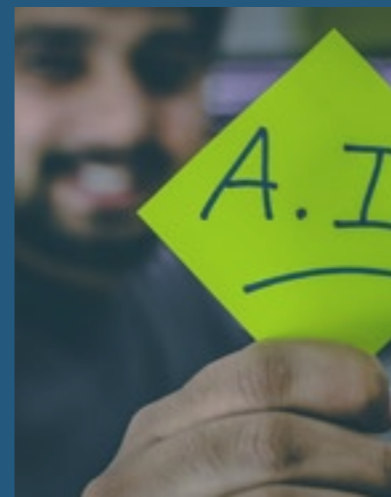Data and Artificial Intelligence-Utilizing Public Administration

Public Administration that Innovates

Functional and modern public administration that provides quality services to citizens and creates a well-established regulatory environment is a key factor for the success of the digital transformation of the economy and society. Public administration should therefore improve its capacity not only to set forth the national strategies and policies, but also to effectively implement them in regions, cities and municipalities with tangible results. Public administration can provide the excellent 21st century services thanks to the predictive analytics and personalization. eGovernment can be perceived as an online platform providing the open application interfaces for innovative solutions for entrepreneurs that will serve both, the citizens and businesses. Such a digital transformation of public administration will create a demand for many value-added solutions, which will enable innovative businesses to succeed in the market.

Public Administration with Sufficient Capacity and Culture of Invention

The culture of invention is an important aspect of successful modernization. Institutions must be able to share, interact and, in particular, experiment, either in draft policies/regulations, or in solving common problems at the national, regional or municipal levels. Such a change requires sufficient human and professional staffing capacity, with a part thereof to work in agile teams. This means that the public administration will change its organizational structure and support the emergence of innovative laboratories and special units.

Data and Artificial Intelligence-Utilizing Public Administration

The significant improvement in data use and the application of methods such as impact assessment, risk analysis, automated case/request assessment, or predictive planning of the future utility capacities is the key for increasing productivity. Successfully introduction of such approaches into practice can bring substantial success. However, all approaches require the quality data and sharing data from different sources, i.e. both, the public, but also commercially-based private sources, for which many actors are not prepared yet.

Territorial Development:

Building smart cities and regions, the development of which is participatory, with the agile use of data

Smart City as a Way to the Modern and Intelligent Territory Development

The development of the territory offers new, modern and better ways of using the territory of Slovakia, which will respect the needs of society, but only if we better understand its use through the data analysis. New technologies can collect huge amounts of real-time data on air quality, soil and water, transport, the needs of citizens and entrepreneurs. The analysis of these data will enable us to plan the development of the state, regions and cities in a new and more agile way, while taking care of the environment and protecting our precious and beautiful nature.

The concept of Smart City can definitely help us in the process of digital transformation of the territorial development of Slovakia; it is an intelligent city, which uses technologies to improve the quality of life in the cities and towns, or in the regions. Thus, Smart City is a part of a city, a city or region that uses different types of electronic sensors to collect a variety of site data (geodata; sensory data; open data; data from citizens) that is subsequently used to effectively manage assets and resources. In turn, the development of the already existing information systems will provide the verified and guaranteed real-time traffic data, which will help better inform the general public about the road, rail and air transports. Thanks to the data obtained from Smart Cities, it will not only be possible to fundamentally change the spatial planning and environmental protection, but also to achieve significant energy savings, improve citizens' mobility/safety, respond to climate changes, ensure a more efficient functioning of the public authorities, and improve the quality of life of citizens.

Good Participatory Spatial Planning that Uses Data and Innovation

However, if we want the Slovak regions, cities and municipalities to become smart places for the quality of life of their inhabitants, we need to significantly improve and transform the current form of spatial planning preparation, which is a determining element in the life of cities and municipalities, but its preparation is largely outdated and does not reflect the needs of the 21st Century. For the current state of preparation of the Slovak spatial plan, it seems necessary to undergo a major transformation in order to be prepared in an agile way together with the strategic planning based on the collection and use of all available data, through participation, experimental pilots and effective communication. Common corridors in the territory would also ensure the efficiency in the network development.

Science, Research and Innovation:

They can keep up with the current world trends and bring new quality scientific knowledge

Functional Ecosystem of Research, Development and Innovation

Science, research and innovation are essential for the success of digital transformation. However, the current state of research, development and innovation is generally regarded as unsatisfactory; without its fundamental changes, a successful and competitive future development of the country cannot be achieved. The necessary changes are aimed at setting a workable ecosystem for research, development and innovation for the digital era, based on the following aspects:

Human resources development: Much attention will be paid to education, encouragement to, and development of skills in science/technology, along with the product development/design/management/sales/funding, to achieve business success;

Aligning the orientation of the scientific and research activities with business efforts: In search of the maximum economic impact, innovations will be perceived from the outset from the perspective of their future commercial applications, with the collaboration of the scientific and research institutions with business to increase their commercialization;

Availability of capital for all stages and levels of R&D: All levels of funding will be supported, from the small research grants at an early stage to the large-scale business-oriented investments. This will lead to the creation of a balanced environment of the state support, euro funds, corporate investments, venture capital and the like;
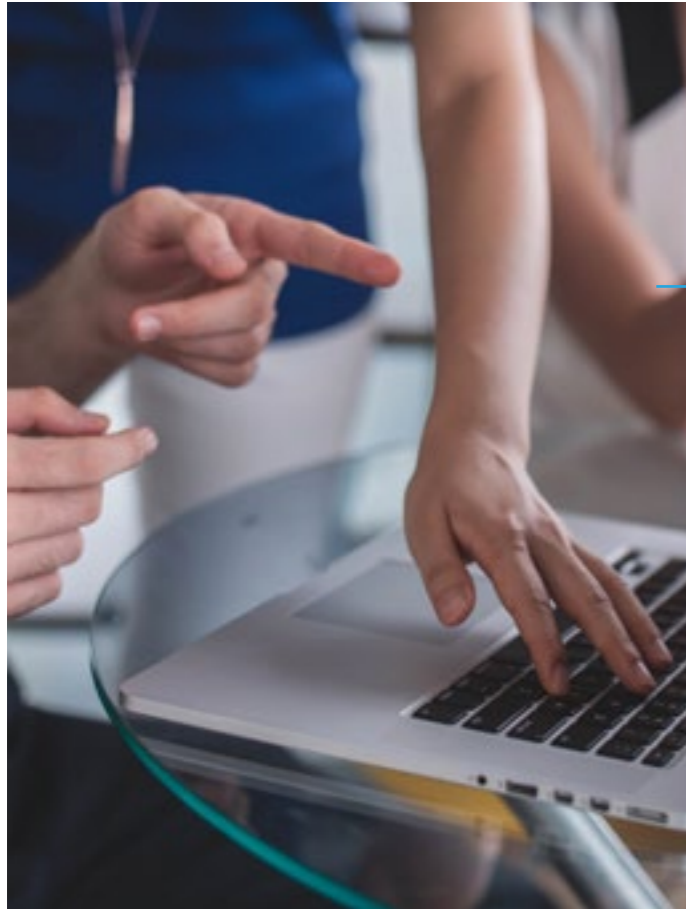
Balanced support from the State: It is crucial to increase investments in science and research in order to improve the scientific and research environment and make it more attractive, to attract domestic and foreign talents and produce excellent scientific knowledge. Therefore, policies, regulations, incentives and taxes need to be put in place to support the creation and growth of the research and development activities. It is important for the industry to influence the development of this ecosystem in terms of the changing needs;

Promoting open science and publishing in an open approach that affects greater science efficiency and makes it more reproducible and transparent: The publicly funded science must be freely available;

Linking the academic, public and private sectors through DIHs: We see the link between academic, the public and the private sectors as key, where we expect DIHs to play the important role to create a platform for exchanging experiences, innovative diplomacy, partnering and linking demand to supply. As a result, our R&D institutions will be able to engage more effectively in the international scientific grant calls; they will establish contacts and cooperate with the prestigious research institutions abroad, and engage in the creation of the international scientific teams, thereby improving the quality of science and research in the country.

Emphasis on Real Results in Science and Research

As our country's resources are limited, it is necessary to:

Concentrate resources – Basic and applied research in the priority technologies will be supported by the Slovak Centre for Artificial Intelligence Research, which can concentrate the best talents, collaborate, and deliver the cutting-edge research and development;

Ensure that the results are controlled and monitored in view of their effect and effectiveness.

Recommendations for the Slovakia 2019–2030 Digital Transformation

Choosing Priority Technologies

Digital transformation focuses on a number of technological trends that make it possible to achieve success in the digital transformation of the economic sectors. It is necessary to critically evaluate the capacities of Slovakia and the prospect of further development of the given trends in Slovakia. If we want to succeed as a small country, we must focus on the technologies:

○ Which wider deployment in practice is at the beginning, especially in the EU;

○ That do not need significant investments beyond the country's capabilities;

○ Capacities for which do exist (in bud);

○ For which we can attract talents from abroad relatively quickly;

○ To which the principles of openness and free access can be applied;

○ That allow multiple usability.

Openness, free access, multiple usability are the qualities that will help meeting the success criteria of projects; these are, at the same time, a feature of the modern civil society. In view of the current trends that meet these requirements, supporting the following priority technologies seem to be most effective:

Artificial intelligence and blockchain:

To be able to make use of the most revolutionary technologies of the present, and to find a sufficient application for them (with the prospect of exporting services). When we talk about AI in Slovakia, we mean two important factors. On the supply side, we need to have enough companies to provide AI services that can design and implement the new business models that are also competitive internationally. In terms of demand, we need our companies to apply sophisticated solutions and innovations in their processes to save costs and operate at a higher level of productivity.

Data and privacy:

To be able to create a functional basis for a vibrant data economy, in which consumers have rights and are secure. The data may represent new oil and, in order to fully exploit its potential, we need to create a comprehensive ecosystem of partners from the private, public and academic sectors that can design services and deliver real applications. We also need data sources. The basic condition for the data economy to function is the creation of the sufficient data sources and the provision of a credible system to manage them.

High Performance Computing (HPC)

To be able to provide high computing and storage capacity that efficiently uses resources, but is also a cornerstone of success in the digital era. However, it is important to keep in mind that the development of the current generation IT systems is reaching the borders of technological possibilities. Another adequate technological development in the next decade is only possible with a paradigm shift. The age of quantum technology is emerging – **quantum computers, quantum cryptography,** and **quantum encoders as part of the IoT** will become technologies that will decide who will succeed in a new IT age.
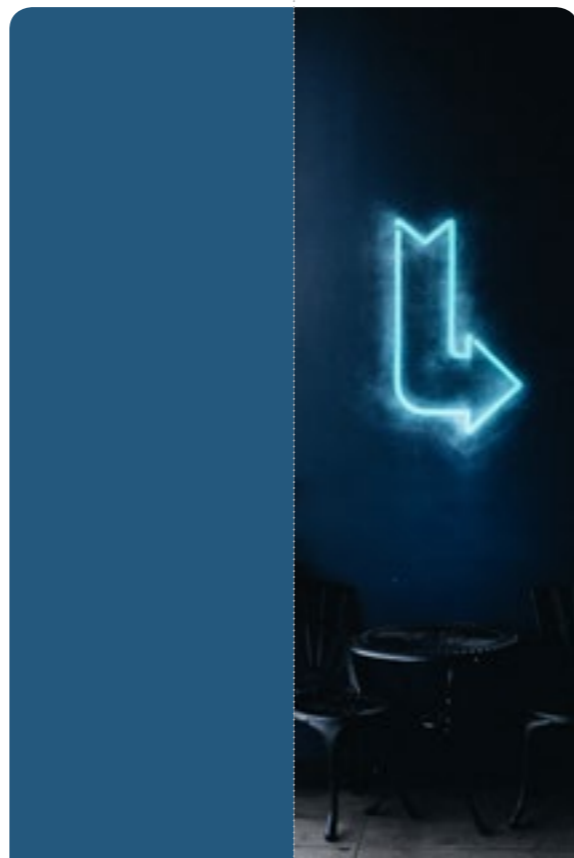
Next-generation fixed and mobile networks:

To be able to make the high-speed broadband connection less accessible, to expand NGA technologies, and to transmit data quickly and without complications. Consequently, it is necessary to build 5G networks to support autonomous and interconnected mobility and intelligent transport systems, with the expected massive future use.

Internet of Things (IoT):

To be able to use technologies, where we already have a promising potential as a country. Specifically, the content of education of several primary, secondary and higher education institutions in Slovakia is already enriched with the IoT issues, thanks to which Slovak pupils and students achieve excellent results from IoT and robotics.
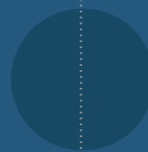
Short term Strategy Horizon of 2019–2022

Measures that can be implemented since 3Q 2019, with their implementation expected by 2Q 2022, are designated as measures for a short-term horizon. Their funding is linked to the 2014-2020 Programming Period. Measures for the short-term horizon will become the basis for the ***2019-2022 Slovakia Digital Transformation Action Plan***, which will be directly related to the *Strategy of Digital Transformation of Slovakia by 2030*. Three **anticipated priority areas** have been established within the short-term horizon, based on the initial state of Slovakia and global and European priorities, which will form the basis for the concrete measures of the *Action Plan for Digital Transformation of 2019- 2022:*

Short term Strategy
Horizon of 2019–2022

1

We will support the digital transformation of schools and education to enhance their quality, improve employment preconditions and acquire the skills needed for the digital era

1.

Lifelong learning and competence for the digital economy

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2019–2022

In the short term, preparation for education in the digital era needs to be accelerated – by adapting the state and educational programs of schools, university/ higher education institution degree programs, courses focused on data science, and programming for all levels of the education system. As part of drafting the Educational System Informatisation Programme by 2030 and implementing pilot projects to improve the quality of teaching, digital transformation of schools and education, to support changes in learning to enhance teachers' professional competences and pupils' competences for the digital economy, introduce the systematic lifelong (continuous) teacher education, promote the personalized learning, motivate pupils for learning, offer strong support for soft skills, stronger links between education and practice, and others. It is essential to support the retraining of the workforce, in particular the "45+ generation" in the digital economy, to put in place an effective system with a financial support scheme for lifelong learning and enhanced digital skills.

Digital competences should be encouraged from the lowest age, considering the use of progressive digital technologies in education, including AI, to increase the success of the learning process. In cooperation with the Digital Coalition, we will prepare the Analysis of the State of Digital Skills in Slovakia with a proposal for concrete measures, and will actively engage in a pan-European training and retraining programme for employees in the digital economy. The State will create the conditions and tools to protect its citizens, especially, but not only, those most vulnerable ones (children, young people and the elderly) from the negative consequences associated with improper and disproportionate deployment and use of digital technologies and deepening the generation gap in the use of digital technologies, and access to them. The lifelong learning system aims to introduce validation and recognition of the previous learning outcomes and to set up the accredited continuing education programs in IT qualifications and their description within the National Qualifications System.

2019–2022

Modernizing and Opening up the Labour Market

It is important to adapt the rules of the labour market to the digital era: to allow meaningful and flexible social assurance for the platform economy workers and to assess the effects of the platform economy and work changes in the digital era in the labour law and its institutes in the context of the entities concerned. We also need to greatly simplify the possibility of attracting the best foreign experts for the needs of innovative businesses, as well as to science and research institutions.

Short term Strategy
Horizon of 2019–2022

We will create the foundations for a modern digital and data economy and for the digital transformation of the wider economy

2

2.

Slovakia will become a dynamic data economy within the EU

The legislative environment will be set up so as to allow the application of the new platform and AI-based business models in practice. There should be sufficient demand for innovative solutions within the economy to maintain a sufficient market and generate innovation. Thus, Slovak companies will employ a growing number of data analysts. New innovation is expected to be exported within the Single Digital Market in Europe and beyond. We will consider introducing a systematic assessment of impacts of regulations on innovation and the digital economy, including a legislative assessment of the impact of technology on

the citizens' rights and freedoms. We will streamline and simplify the data-related legal framework in order to make Slovakia a model country for further regulation within the EU. We will set the rules for data processing and algorithms in such a way that the public can trust the data economy, whether by the management of personal data supported by citizens, or by creating a public data trust.

We will support innovative capacity and implementation of solutions based on artificial intelligence

We will improve the options of collaboration with the academia in the applied AI research and data. We will greatly simplify the process enabling depreciation of R&D investment. At the same time, we will support new business models in the digital economy so that platforms disrupting the standard sectors, such as transport, finance and health can occur in Slovakia. It means creating "control sandboxes", introducing future-proof regulations, and redesigning licensing procedures for the needs of digital era.

2019—2022

We need important innovations to really emerge directly in Slovakia

We need to provide enough experts, quality teaching at universities (the teaching quality management centres), and transfer of innovation to practice. For this purpose, the Slovak Centre for Artificial Intelligence Research and the Teaching Quality Management Centres will be established, which will work closely with the top research centres abroad. This will be supported by the emergence of the National Innovation Lab and the HUB for teaching quality management. We need to provide enough experts, quality teaching at universities and the transfer of innovation to practice. We will explore the possibilities of simplifying the process of acquiring the right of residence for top experts. We will launch activities under the *Coordinated Plan for Artificial Intelligence* (COM(2018) 795 final)[6], which will be followed by efforts in the long term.

We will create the conditions for smart mobility

Slovakia is currently lagging behind in its commitments to the EU in terms of building communications networks, intelligent transport systems and supporting cross-border testing of interconnected and autonomous vehicles. Strengthening capacities, developing a strategy/action plan, adjusting the legislative environment, actively participating in transnational working groups, strengthening the coordination of stakeholders and better cooperation between the private, public and academic sectors are indispensable prerequisites for catching up this delay. We are interested in becoming a country, where new business models can be tested in transport. The goal is to create services based on the traffic data processing in Slovakia in order to provide space for the new platform testing. We will design transport policies and address traffic problems through the data analysis and data processing. Innovations in regulations are important to enable innovative companies to bring new solutions to smart mobility. Transport platforms need high-quality data, especially the accurate mapping bases. It is essential to ensure that building an infrastructure for smart mobility is part of the national research and development.

Innovation of the financial sector will be tested in Slovakia

The Ministry of Finance of the Slovak Republic performs the function of the innovation lab through the Financial Innovation Centre. In the near future, an innovative hub will be established at the National Bank of Slovakia, and the possibility of introducing the concept of regulatory sandbox of financial innovations explored. At the same time, the need for, and the most appropriate form of, crowd-funding regulation is being currently analyzed. A significant contribution to financial innovation could also be expected from setting up a system for asset tokenisation. A significant strengthening of the capacities of the Financial Innovation Centre and the National Bank of Slovakia for these purposes could be a suitable tool for strengthening the process of introducing financial innovation.

Building a network communication infrastructure built on NGA technologies

Also, through the Broadband Competence Office competencies, we will strive to expand Internet access in Slovakia without restrictions. In pursuit of implementing optical coverage, the State shall support the construction projects in areas with the lower household densities (where optical coverage providers face the economic constraints), as well as in terms of the effective regulation and investment-supportive legislative environments. Available broadband networks and high-speed connectivity are a prerequisite for the economic growth and building a modern society that would be ready to face the challenges of the 21st century. We want to start talking about the broadband as the 4th utility.

We will support the preparation for the deployment of the safe and high-speed 5G networks to ensure the balanced regulatory conditions, healthy competition and a friendly pro-investment environment. Likewise, support for IPv6 deployment will help improve connectivity for a large number of clients (public administration, businesses, homes) and a large number of IoT devices, and cyber security.

Short term Strategy
Horizon of 2019–2022

3.

We will improve the capacity of public administration to innovate and use data for the benefit of citizens

3.

We will launch the implementation of the "Data-Driven State" concept

The public administration learns to innovate

This intention requires a significant improvement in the use and processing of data for the analytical purposes by the public administration institutions so that the public administration can provide quality services, and the State can make decisions based on the best available knowledge. As part of this process, we will ensure compliance with relevant legislation; and we will establish control mechanisms at a national level to safeguard the fundamental rights and freedoms of data subjects. Our institutions need to know how to actually use the data. It is also necessary to propose a transformation of the organization so that real data-based decision making can take place. Such a change in the functioning of public administration requires actions to be taken at all levels of public administration, which must follow global trends in the field of Smart Cities, and make its data available for recovery on a fair and balanced basis. The change envisaged also needs political support and strong technical capabilities. The initiative is centrally coordinated by the Public Administration Data Office, which was established at the Office of Deputy Prime Minister of the Slovak Republic for Investments and Informatization. Frameworks will be centrally designed, but real changes in institutions can be implemented locally, so there will be room for implementation of the transformation projects supported by technologies, such as AI or block chain, within the Integrated Infrastructure Operational Programme. As part of this effort, it will then be possible to continue implementing the DEP projects.

The creation of an umbrella strategy for research, development and use of artificial intelligence is critical in order to support the creation of an overall ecosystem for deploying solutions based on credible AI[7] and digital technologies in public administration and society. On this basis, a detailed concept of AI will be elaborated in the conditions of the Slovak Republic until the end of 2019. In its framework, each department of public administration shall define its priorities and departmental measures. This will ensure that the enormous potential of artificial intelligence is used to drive the digital transformation of Slovakia, while minimizing the risk

aspects associated with this technology. It will significantly reduce the time needed to implement innovations in practice. It will be standard for the public administration to test the pilot solutions and use innovative procurement methods. Efforts should be made to reduce the innovation cycle of IT solutions and, subsequently, adapt the rules in public administration thereto. Experimenting, organizing tenders and involving small and medium-sized enterprises will become an essential standard for the functioning of the public administration institutions. We will, therefore, reform the principles of partnership with the academic and private sectors. Adjustments will be proposed to the procurement processes, higher transparency principles will be introduced, and a focus on results will be preferred. We expect a significant support for experimenting with technology in the public administration (while ensuring stringent security conditions indeed), and the overall change of culture towards the start-up thinking, or implementing the "e-Government as a platform" concept into practice, which means that innovations of utilities could be also created by third parties, the private sector or non-profit organizations in an interesting way.

References and Data Sources

1. EUR-Lex, European Commission, Proposal for a Regulation establishing the Digital Europe Programme for the period 2021-2027, *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A434%3AFIN* (21.3.2019)

2. EUR-Lex, European Commission, Regulation establishing the Connecting Europe Facility, *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R1316* (20/3/2019)

3. Geoffrey G.Parker, Marshall Van Alstyne, and Sangeet Paul Choudary: Platformová revolúcia [Platform Revolution], W.W. NORTON & COMPANY, 2016

4. SME, Na Slovensku sa vlani vyrobilo rekordné množstvo áut [A record high number of cars was produced in Slovakia last year], *https://ekonomika.sme.sk/c/22025271/na-slovensku-sa-vlani-vyrobilo-rekordne-mnozstvo-aut.html* (15/1/2019)

5. C-Roads, *https://www.c-roads.eu/platform.html*

6. European Commission, Coordinated Plan on Artificial Intelligence, *https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence* (8.12.2018)

7. Draft Ethics guidelines for trustworthy AI *https://ec.europa.eu/digital-single-market/en/news/draft-ethics-guidelines-trustworthy-ai* (18.10.2018)