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Digital New Deal for V4: How do we stand with new technologies?

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Content

1. Introduction

Kryštof Kruliš

The economic convergence of V4 countries to the EU average (per capita GDP and by added value) is still an endeavour of many decades. During these future decades the economic and social environment will be strongly influenced by new technologies, including the Internet of Things, automatization and robotization, Artificial Intelligence and Machine Learning, autonomous cars and drones, blockchain and various new ways of using the internet in everyday life and for economic transactions. The technological advances will influence not only the manufacturing sector, but also provision of services, logistics and how we spend our free time. All this will bring substantial economic and social changes to the central European region. Growth patterns that have been employed recently in our region may not be available in the near future. Now is the time to ask leading stakeholders from the associations of industries and start-ups, trade unions, consumer organizations, the academic field and politics about their vision of the region´s future and what can be done to optimize the benefits of new technologies and limit their downsides. This policy paper provides a synthesis of perspectives of over eighty stakeholders from the V4 region and seeks to initiate a broader discussion about a vision for our region.

The *Digital New Deal* project has been kindly supported by the International Visegrad Fund and is implemented by the Association for International Affairs (AMO) in cooperation with the Free Market Foundation (Hungary), Industrial Foundation (Poland) and F. A. Hayek Foundation (Slovakia). It follows the project entitled Smooth Functioning of the Internal Market between V4 Countries implemented in 2014-2016.[1]

Digitalisation is going to effect the world in the not so far future. Companies, and states alike are already preparing for these changes. In order to be ready for future challenges in the V4 region, we must know what to expect from digitalisation and the new industrial revolution. Assessing the pace of technological adaptation is paramount for creating a suitable legal environment, passing correct legislation, and business regulation.

This policy paper tries to spur national and regional debates on these issues. For this purpose it reflects the opinions of leading stakeholders from the associations of industries and start-ups, trade unions, consumer organizations, the academic field and politics and their vision of the V4 region´s future and what can be done to optimize the benefits of new technologies and limit their downsides. Four researchers, each in one of the V4 countries, initiated interviews with national stakeholders using one common questionnaire (provided in the Appendix of this paper). All of the questions in the questionnaire were optional, i.e. every interviewee had a chance to skip any question. The questionnaire thus did not serve as an exhaustive list of obligatory questions but rather as a framework allowing participating stakeholders to express their opinions. This approach also reflected differences in national discourses of the V4 countries and allowed for a flexible structure of individual chapters whilst keeping the same goals and methodological focus.

Some questionnaires were filled in directly by respondents and sent to the authors, some were filled in during a direct interview between the stakeholder and the researcher. The interviews were conducted primarily in July and August 2018 and in Czechia and Hungary partly also in September 2018. The outcomes of the interviews were combined also with outcomes from direct meetings with stakeholders on roundtables or from publicly available media articles. In total 65

1 Project website available here: https://www.amo.cz/en/smooth-functioning-of-the-internal-market-between-v4-countries-en/.

persons provided either direct interviews, filled in the questionnaire or were directly engaged at official roundtables attended or chaired by one of the authors. In addition to this, the opinions of 26 stakeholders were reflected from media.

This policy paper offers a synthesis of the perspectives of more than eighty people from the V4 region.

2. Hungary

Máté Hajba

2.1 Introduction

The insight into Hungarian views on new technologies in this chapter is based on a series of four direct interviews and is supplemented by publicly available opinions of a further eleven stakeholders based on interviews or articles in the media. Half of the directly interviewed experts in Hungary asked to remain anonymous. The list of those consulted follows.

In the form of personal interviews:

- András Tóth, MTA TK senior research fellow, who represented two categories: Scholars, think-tanks or consultancy; and Civil Society (labour unions and consumer protection groups)
- Katalin Pál, research manager, GKI Economic Research Co., who also represented two categories: Scholars, think-tanks or consultancy; and Chambers of Commerce and associations of employers
- Two of the respondents asked to remain anonymous (both were from the category: scholars, think-tanks or consultancy)

In the form of media appearances:

- György Matolcsy, Governor of the Central Bank of Hungary[2]
- Péter Szijjártó, Minister of Foreign Affairs and Trade[3]
- Nándor Csepreghy, former Deputy Minister of the Prime Minister's Office[4]
- Ágnes Hornung, Minister of State for Financial Affairs[5]
- Róbert Hausmann, analyst at the Central Bank of Hungary[6]
- Tamás Deutsch, Prime Ministerial Commissioner for the Digital Success Programme[7]
- Csaba Rigó, President of the Public Procurement Authority of Hungary[8]
- Róbert Ésik, President of the Hungarian Investment Promotion Agency[9]
- Dávid Greskovits, President of MAGYOSZ[10]

[2] Portfolio.hu (2018) "Matolcsy György: építsünk új stratégiát!" portfolio.hu at https://www.portfolio.hu/gazdasag/matolcsy-gyorgy-epitsunk-uj-strategiat.278747.html and Youtube.com (2018) "MKIK Gazdasági évnyitó 2018 - Matolcsy György", youtube.com at https://www.youtube.com/watch?v=n19LpaqpQRs&feature=youtu.be.

[3] Magyar Idők (2018) "Szijjárto Péter: A siker kulcsa a termelés és digitalizáció összekapcsolása", Magyar Idők at https://magyaridok.hu/belfold/szijjarto-peter-siker-kulcsa-termeles-es-digitalizacio-osszekapcsolasa-2866266/ and Origo.hu (2018) "Szijjártó: Versenyképes a magyar autóipar", origo.hu at http://www.origo.hu/gazdasag/20180222-szijjarto-versenykepes-a-magyar-autoipar.html.

[4] Infótér (2017) "A versenyképesség kulcsa a digitalizáció" Infótér at http://infoter.eu/cikk/csepreghy-a-versenykepesseg-kulcsa-a-digitalizacio.

[5] Kormany.hu (2018) "Több száz milliárd forintot spórolhat az ország a készpénzmentes fizetéssel", kormany.hu at http://www.kormany.hu/hu/nemzetgazdasagi-miniszterium/penzugyekert-felelos-allamtitkarsag/hirek/tobb-szaz-milliard-forintot-sporolhat-az-orszag-a-keszpenzmentes-fizetessel.

[6] Mnb.hu (2017) "Hausmann Róbert: Digitalizáció – Versenyképességi fókuszpont az államigazgatás számára is", mnb.hu at https://www.mnb.hu/kiadvanyok/szakmai-cikkek/tovabbi-szakmai-cikkek/hausmann-robert-digitalizacio-versenykepessegi-fokuszpont-az-allamigazgatas-szamara-is.

[7] Digitalisjoletprogram.hu (2018) "Mindenki legyen a digitalizáció nyertese Magyarországon", digitalisjoletprogram.hu at https://digitalisjoletprogram.hu/hu/hirek/mindenki-legyen-a-digitalizacio-nyertese-magyarorszagon.

[8] Piacesprofit.hu (2018) "A közbeszerzéseknek is jót tesz a digitalizáció", piacesprofit.hu at https://piacesprofit.hu/kkv_cegblog/a-kozbeszerzeseknek-is-jot-tesz-a-digitalizacio/.

[9] Portfolio.hu (2018) "Magyarország a hetedik legnépszerűbb befektetési célpont a világban", portfolio.hu at https://www.portfolio.hu/gazdasag/magyarorszag-a-hetedik-legnepszerubb-befektetesi-celpont-a-vilagban.296798.html.

- Bence Holló, CEO of Cofidis Hungary[11]
- Gábor Bojár, CEO of Graphisoft SE[12]

2.2 Expectations about the future importance of new technologies

The first part of the questionnaire focuses on outlooks of how digitalisation will affect society. Three of the experts agreed that **during the period of 2018-2030 new technologies will change our lives faster than ever before**. This shows that expectations are high, and a lot of potential is seen in future technologies. The importance of adoption of new technologies is also substantiated by a number of the media appearances of experts and government officers examined in this paper. Péter Szijjártó, Minister of Foreign Affairs and Trade emphasized the need for adaptation, and claimed that the government is incentivising companies to adopt new technologies and to digitalise, as that would increase competitiveness[13]. Other government officials also expressed the importance of digitalisation whether in the form of cashless payments, or industry 4.0.[14] However **one respondent** to the questionnaire remarked, that during the period of 2018-2030 new technologies will change our lives but it will be **comparable to changes we have witnessed in previous decades.**

2.3 Global pace of adoption of new technologies from the Hungarian perspective

Having gauged expectations, it is important to put the pace of adoption into context. The next part of the questionnaire focused on finding out which countries and regions are trendsetters, that is faster at adopting new technologies, which are average and which are slow. It is not enough just to perceive that new technologies are being adopted in Hungary, but a comparison must be made on how it is in other places. This serves as a guideline to see how much if any work Hungary has to do in order to catch up with other regions.

75% of the respondents agreed that the **V4 is average in the adoption of new technologies**, while 1 expert deemed it slow. 2 of the respondents grouped all V4 countries in the average category. **The Czech Republic was deemed by 2 respondents as better at new technologies than the rest of the region.** Hungary was identified as an average adopter by 50%, and slow by the other half. **One respondent deemed adoption to be slower in Hungary than in the whole of the V4.** It shows that the region has some catching up to do compared to some other countries, although one respondent suggested that the V4 and the EU are on the same level, average, but the same person deemed Hungary to be slow.

[10] Portfolio.hu (2018) "Automatizálással válaszolnak a kihívásokra a hazai gyógyszercégek (Interjú)", portfolio.hu at https://www.portfolio.hu/gazdasag/egeszseggazdasag/automatizalassal-valaszolnak-a-kihivasokra-a-hazai-gyogyszercegek--interju.298060.html.
[11] Webradio.hu (2018) "Cofidis: a magyarok alig ötöde használja az innovatív pénzügyi megoldásokat", webradio.hu at http://webradio.hu/hirek/gazdasag/cofidis-a-magyarok-alig-otode-hasznalja-az-innovativ-penzugyi-megoldasokat.
[12] Hvg.hu (2018) "Bojár Gábor: A III. informatikai forradalom", hvg.hu at https://hvg.hu/tudomany/20180915_A_III_informatikai_forradalom.
[13] Magyar Idők (2018) "Szijjárto Péter: A siker kulcsa a termelés és digitalizáció összekapcsolása", Magyar Idők at https://magyaridok.hu/belfold/szijjarto-peter-siker-kulcsa-termeles-es-digitalizacio-osszekapcsolasa-2866266/.
[14] For example in an interview Nándor Csepreghy, then Deputy Minister of the Prime Minisiter's Office: Infótér (2017) "A versenyképesség kulcsa a digitalizáció" Infótér at http://infoter.eu/cikk/csepreghy-a-versenykepesseg-kulcsa-a-digitalizacio.

The EU was considered a fast adopter by 3 respondents and average by 1. **The United Kingdom, the United States of America, and Japan were deemed by everyone to be fast adopters.** Germany, a country with an important impact in the region was deemed a fast adoper by 2 and average by 2 experts. Opinion varied on France, 2 people identified the country as a fast adoper, yet another 2 as a slow adopter. From media appearances it is evident that Hungary is behind the EU average but György Matolcsy, Governor of the Central Bank of Hungary revealed that the plan is to achieve the EU average by 2030, and reach the level of development of Austria by 2050.[15] This means that Austria is considered as the standard which should be achieved.

2.4 Comparative strengths and weaknesses of Hungary

STRENGTHS

Experts were asked to assess Hungary's strengths and weaknesses from the point of view of the adoption of new technologies. Respondents identified the following as strengths:

- Political will and government intentions for adopting new technologies
- High amount of foreign direct investment (FDI)
- Size of the capital, infrastructure and geographical concentration
- Labour shortage (which necessitates automatization)
- Widely available broadband internet
- Good tradition in electrical engineering

The government's intentions for adoption and digitalisation were mentioned by 2 respondents. This is further substantiated by reviewed media appearances, where government officials talk about the importance of digitalisation, such as cashless payments,[16] or as was previously mentioned the economic aim cited by György Matolcsy, Governor of the Central Bank of Hungary, to reach the EU average by 2030, and Austria by 2050. He claims that Industry 4.0 and Society 5.0 are key elements of the strategies of developed countries, and Hungary needs to adapt.[17] Hungary has also created the so-called **Digital Success Programme**, lead by Tamás Deutsch, Prime Ministerial Commissioner for the Digital Success Programme. The Commissioner revealed that the aim of the Programme was **to make everyone a winner of digitalisation.**[18] Making internet widely available is also included in the Programme, and one respondent in the questionnaire identified widely available broadband internet as a strength.

Interestingly a pressing problem of Hungary, **labour shortage, was also identified as a strength,** the reason being that it will **incentivise automatization.** The effects of these were described by Dávid Greskovits, President of MAGYOSZ, an association of Hungarian pharmaceutical manufacturers, who claims that automatization is a solution for the growing labour shortage.[19]

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[15] Portfolio.hu (2018) "Matolcsy György: építsünk új stratégiát!" portfolio.hu at https://www.portfolio.hu/gazdasag/matolcsy-gyorgy-epitsunk-uj-strategiat.278747.html.
[16] Kormany.hu (2018) "Több száz milliárd forintot spórolhat az ország a készpénzmentes fizetéssel", kormany.hu at http://www.kormany.hu/hu/nemzetgazdasagi-miniszterium/penzugyekert-felelos-allamtitkarsag/hirek/tobb-szaz-milliard-forintot-sporolhat-az-orszag-a-keszpenzmentes-fizetessel.
[17] The full speech can be view on youtube. Youtube.com (2018) "MKIK Gazdasági évnyitó 2018 - Matolcsy György", youtube.com at https://www.youtube.com/watch?v=n19LpaqpQRs&feature=youtu.be.
[18] Digitalisjoletprogram.hu (2018) "Mindenki legyen a digitalizáció nyertese Magyarországon", digitalisjoletprogram.hu at https://digitalisjoletprogram.hu/hu/hirek/mindenki-legyen-a-digitalizacio-nyertese-magyarorszagon.
[19] Portfolio.hu (2018) "Automatizálással válaszolnak a kihívásokra a hazai gyógyszercégek (Interjú)", portfolio.hu at https://www.portfolio.hu/gazdasag/egeszseggazdasag/automatizalassal-valaszolnak-a-kihivasokra-a-hazai-gyogyszercegek--interju.298060.html.

Another strength cited by one expert was the **high number of foreign investments.** Róbert Ésik, President of the Hungarian Investment Promotion Agency, reported that in 2017 foreign capital created 5500 new jobs in Budapest, placing the city 6th amongst EU capitals. In Hungary 17 500 jobs were created through foreign investments, the highest amount since 2002.[20] The country is the 7th most favoured place to invest in worldwide, according to IBM Global Location Trends 2017.

Hungary's **strength in electrical engineering** was also emphasized by Gábor Bojár, CEO of Graphisoft, (a company that builds software for architects), who claimed that technological and mathematical education is still strong in Hungary.[21] This seemingly **contradicts the lack of adequate education later cited as a weakness, however the aforementioned article by Mr. Bojár also claims that the quality of education is decreasing.**

WEAKNESSES

Experts were also asked to name the weaknesses of Hungary. Although in the previous section, dealing with the pace of adoption in Hungary and the region most respondents viewed Hungary as average, **more weaknesses were cited than strengths. Some of the weaknesses seem to contradict strengths.** The interviewed experts viewed the weaknesses that are making adoption of new technologies more difficult as:

- Government corruption
- High taxes
- High regulation
- Monopolies created by regulation
- Political control of every segment of life
- Low budget allocated for digitalisation
- Low wages
- Educational system is not adequate
- Fear of machines and new technologies
- Fear of change in some rural areas.

Most of the interviewees named **government interference**, whether in the form of taxation, regulation, or monopolisation as a weakness. Political control is also cited as prevalent in every segment of life.

Government corruption was also identified as a weakness. Interestingly the government seems to have realized the danger of corruption or at least the importance of its perception, and provided a digital solution in the form of **a mobile app, aimed at making public procurements more transparent.** According to Csaba Rigó, President of the Public Procurement Authority of Hungary, the app has been downloaded by 5000 users, and companies can be informed about new public procurements, as well as information regarding the process, making it more transparent thus decreasing corruption.[22]

Issues with the **educational system** were also named as weaknesses. Róbert Hausmann, an analyst at the Central Bank of Hungary suggested that coding should be taught at schools in order to help students in the job market in their

[20] Portfolio.hu (2018) "Magyarország a hetedik legnépszerűbb befektetési célpont a világban", portfolio.hu at https://www.portfolio.hu/gazdasag/magyarorszag-a-hetedik-legnepszerubb-befektetesi-celpont-a-vilagban.296798.html.
[21] Hvg.hu (2018) "Bojár Gábor: A III. informatikai forradalom", hvg.hu at https://hvg.hu/tudomany/20180915_A_III_informatikai_forradalom.
[22] Piacesprofit.hu (2018) "A közbeszerzéseknek is jót tesz a digitalizáció", piacesprofit.hu at https://piacesprofit.hu/kkv_cegblog/a-kozbeszerzeseknek-is-jot-tesz-a-digitalizacio/.

adulthood.[23] The Digital Success Programme, cited earlier, also incorporates educational aspirations.

Fear of new technologies is also a weakness. For example Cofidis Hungary, a credit institution revealed in a survey, that 57% of Hungarians are open to new financial IT technologies, but only 17% use them. **A third of people don't trust these technologies.** According to the CEO of Cofidis, Bence Holló, the security concerns of people could be eased when fintech is more widely spread[24].

Low wages as a weakness was also identified, as **until the labour force is cheap, or cheaper than digital solutions, there is no incentive to adopt new technologies.** This somewhat contradicts labour shortage, which was cited as a strength, although in the SME sector automatization is still not possible due to the lack of technology.

CONCLUSION ON STRENGTHS AND WEAKNESSES

It is noteworthy, that many of the strengths and weaknesses cited were in connection with the government, **showing a high dependence on the state in Hungary**. Experts think that although the government intends to help and incentivise digitalisation and the adoption of new technologies, some policies hinder these aspirations. Regulation, taxation, education, and corruption are all under the purview of the government, and if it wants to achieve its intention, it has to address these weaknesses.

2.5 Predictions

Experts and stakeholders were asked which technologies have **the largest potential to influence the country's economy.** The respondents identified the following technologies:

- **Cashless payments** - identified by 2 respondents
- **Autonomous cars** - identified by 2 respondents
- **Artificial intelligence** - identified by 1 respondent

Beside the options offered in the questionnaire, one of the respondents provided 2 further technologies, that the respondent deemed to have a large potential to affect the economy:

- **3D printing**
- **Precision agriculture**

The reviewed media appearances further substantiate the importance of these technologies. Ágnes Hornung, Minister of State for Financial Affairs, claimed that **cash payments cost Hungary 450 billion Forints (approximately 1.35 billion Euros), and stressed the importance of cashless payments, the achievement of which is also the focus of government strategies**.[25]

[23] Mnb.hu (2017) "Hausmann Róbert: Digitalizáció – Versenyképességi fókuszpont az államigazgatás számára is", mnb.hu at https://www.mnb.hu/kiadvanyok/szakmai-cikkek/tovabbi-szakmai-cikkek/hausmann-robert-digitalizacio-versenykepessegi-fokuszpont-az-allamigazgatas-szamara-is.
[24] Webradio.hu (2018) "Cofidis: a magyarok alig ötöde használja az innovatív pénzügyi megoldásokat", webradio.hu at http://webradio.hu/hirek/gazdasag/cofidis-a-magyarok-alig-otode-hasznalja-az-innovativ-penzugyi-megoldasokat.
[25] Kormany.hu (2018) "Több száz milliárd forintot spórolhat az ország a készpénzmentes fizetéssel", kormany.hu at http://www.kormany.hu/hu/nemzetgazdasagi-miniszterium/penzugyekert-felelos-allamtitkarsag/hirek/tobb-szaz-milliard-forintot-sporolhat-az-orszag-a-keszpenzmentes-fizetessel.

Péter Szijjártó, Minister of Foreign Affairs and Trade emphasized that one of the principal pillars of the Hungarian economy is **car manufacturing. This sector leads the new industrial revolution, and the Minister revealed that the government wants new breakthroughs in the fields of electric, and autonomous cars**.[26]

2.6 Obstacles to development, structural changes and recommendations

Whereas the first part of the questionnaire focused on the assessment of the adoption of new technologies, the second half aimed to find solutions and best practices. In order to start talking about these, the potentials of Hungary must be examined.

Having ascertained the most important sectors in the future of Hungary's economy from the point of view of digitalisation, interviewees were asked to identify the obstacles to adoption of new technologies. Some of these were the same as weaknesses cited previously.

Political environment played a key factor in the obstacles that hinder the adoption of new technologies, reflecting the opinion of the respondents during the questions on strengths and weaknesses. 3 interviewees cited this as an obstacle in one way, or another.

Barriers to new technologies were named as:

- High taxes
- High amount of regulation
- Corruption
- Monopolies
- Lack of reliable political environment
- Stakeholder groups' special relationship with the government
- Innovations are still dependant on state or EU subsidies
- Rule of law deficit
- State interference
- Insufficient protection of property rights

Two of the respondents elaborate, that **stakeholder groups or monopolies affect legislation**. One of the respondents brought the example of **Uber, which left Hungary, due to the effective lobbying of taxi drivers**. The interviewee raised the point that **if influential national interest groups do not benefit from new technologies,** the state will not allow them to be adopted. This is reflected in other answers as well, such as the lack of a reliable political environment, corruption, and the high amount of regulations. One of the respondents added that **over-reliance on subsidies whether from the state or the EU also hinders progress.**

After identifying obstacles respondents were asked what structural changes need to be made in order to overcome these. All of the answers included major changes in the current political environment:

- Smaller less intrusive government
- Less regulation
- Less tax burden
- Democratisation

[26] Origo.hu (2018) "Szijjártó: Versenyképes a magyar autóipar", origo.hu at http://www.origo.hu/gazdasag/20180222-szijjarto-versenykepes-a-magyar-autoipar.html.

- A less centralized system of government with particular interest groups not having so much influence on the decision making process
- Evolving the competitive markets
- The government stepping away from economic processes

All respondents want the government to take a less active role in managing the economy, in order to allow it to flourish. More specific answers were given in the form of less taxes and regulations, as well as decentralization. It shows that according to the respondents large-scale structural and policy changes would be needed in order for Hungary to reach its full potential.

The third aspect of the best practices section focused specifically on the role the government should take in the adoption of new technologies. Here respondents gave more specific recommendations than in the previous section. In this part it was also stressed that the government should take a less active role.

How should the state help with adoption of new technologies and development of the knowledge economy?

- **Let the economy flourish, do nothing (save deregulation and less taxation)**
- By improving **higher education and investing in the educational system**
- By increasing the **transparency of the economy**
- By **imposing less regulations** on virtually all aspects of the economy.
- Keeping far away from it. Elaborating the system of market based professional education (both secondary and tertiary level) with ways of helping the less well-to-do students

Besides the importance of a less interfering state, respondents also highlighted that **education plays a crucial part in future technologies**. In this latter aspect, the role of the government was less debated, and the need to improve higher education was especially emphasized.

2.7 Best practices

Only two respondents cited best practices, whether state programmes, or business solutions, that could be adopted in other countries of the region:

- Kormányablakok
- Private schools

The first, **Kormányablak (Government Window),** is a customer service center of the government, located in several places nationwide, who have access to the e-government system of Hungary.[27]

Private schools such as Kürt Academy, and Aquincum Institute of Technology were also named as best practices. The former is a private academy focusing on digital skills,[28] while the Aquincum Institute of Technology "provides **a unique English language study abroad experience for North American undergraduates majoring in computer science, software engineering, and related disciplines"**, as cited on its website.[29]

Despite the respondents wanting the government to let the economy flourish one of the best practices mentioned has been a government programme, involving e-governance. This shows that while the state should

[27] Kormányablak can be accessed online through this link: https://kormanyablak.hu/hu.
[28] The website of Kürt Academy can be accessed through this link: https://kurtakademia.hu/.
[29] The website of the Acquincum Institute of Technology can be accessed through this link: https://www.ait-budapest.com/.

take a less active role in the economy, digitalisation can still be an important aspect for the administration.

3. Poland

Marcin Frenkel

3.1 Introduction

The insight into the Polish approach in this chapter is based on a series of interviews with eight individuals who are well acquainted with the main topics of the analysis. All directly interviewed experts in Poland asked to remain anonymous. The interviewees belonged to the following groups:

- 4 experts from the group of academic/consultancy/think-tanks,
- 1 representative of a political party,
- 1 manager of a start-up,
- 2 persons from the category of associations of IT companies and employers associations.

Moreover, the views of the current prime minister of Poland as well as the adviser to the president of the Republic of Poland on the so-called industry 4.0 have been presented from publicly available sources together with perspectives of professor Stanislaw Gomulka,[30] a general economist at the Business Centre Club, a philosopher and a scientific journalist Łukasz Lamża,[31] and journalist and futurologist Edwin Bendyk.[32] Further insights of Polish experts were mentioned in the opening paper of our project.

3.2 Expectations of future importance of new technologies

When analyzing survey responses, it must be stated that the great majority of participants agreed that in the years 2018-2030 **new technologies will be changing our lives even faster than in the past.**

This conviction is also shared by many Polish experts whose voices are present in the mass media. As the journalist and futurologist Edwin Bendyk notes, the supply of innovations in the economy will take place at an exponentially accelerating rate (just as with the development of computers according to Moore's law).[33] Professor Stanislaw Gomulka, a general economist at the Business Centre Club, agrees that the development of new technologies will be faster than ever before, however he advises emotional restraint. The professor sees the process as a continuation of the industrial revolution from the 18th century rather than something revolutionarily new.[34] The philosopher and scientific journalist Łukasz Lamża also underlines the gradual nature of digital changes. Using the example of artificial intelligence, he points out that generally people are awaiting ingenious

[30] Cieślak-Wróblewska, A (2018), "Gospodarka 4.0 jest nieunikniona", rp.pl, 6 June 2018, at: https://www.rp.pl/100-lat-polskiej-gospodarki/180609574-Gospodarka-40-jest-nieunikniona.html.
[31] Lamża, Ł (2018), "Sztuczna przeciętność", Tygodnik Powszechny, 9 September 2018, p. 77.
[32] Bendyk, E (2012), "Konkurencje w złożonym świecie", Cyfrowa Gospodarka. Kluczowe trendy rewolucji cyfrowej, Warsaw 2012, p.10, at: http://www.euroreg.uw.edu.pl/dane/web_euroreg_publications_files/1335/cyfrowa_gospodarka_kluczowe_trendy_rewolucji_cyfrowej.pdf.
[33] Bendyk, E (2012), "Konkurencje w złożonym świecie", Cyfrowa Gospodarka. Kluczowe trendy rewolucji cyfrowej, Warsaw 2012, p.10, at: http://www.euroreg.uw.edu.pl/dane/web_euroreg_publications_files/1335/cyfrowa_gospodarka_kluczowe_trendy_rewolucji_cyfrowej.pdf.
[34] Cieślak-Wróblewska, A (2018), "Gospodarka 4.0 jest nieunikniona", rp.pl, 6 June 2018, at: https://www.rp.pl/100-lat-polskiej-gospodarki/180609574-Gospodarka-40-jest-nieunikniona.html.

robots – known from Sci-Fi movies – when the technology is already present and working e.g. in GPS devices, in social media or in graphic programs.[35]

3.3 Global pace of adoption of new technologies from Polish perspective

Unanimity of opinions was no longer in place when the participants were asked about which countries will be the ones to experience the most intensive changes. Here, the responses varied to such a great extent that it would be difficult to come to a general conclusion. Nonetheless, most participants identified **Japan and China as the countries where the fastest changes are to take place,** in contrast to **Russia, where the slowest pace of such changes was expected.** In the majority of the responses the **Visegrad Group (V4)** countries were identified as the ones in which introducing the achievements of the digital revolution will happen **at a moderate pace.**

Some additional light on the issue is shed by "The Digital Poland" – a report published by the Polish branch of McKinsey and Company. A particularly interesting data set presented there is the "Digitalization Index" which measures the level of digitalization of the economy. According to the authors the most "digital" country in the world is the USA where 18% of the whole economy is digitalized. This number for Western Europe is 12% and for Poland it is 8%. That means – as the report states – the process of digitalization of the economy everywhere is at an initial stage. In this respect the gap between global leaders and countries like Poland is relatively small and easy to overcome.[36]

A different approach to measuring the level of digitalization is presented by a report by "Polityka Insight". This think tank examined the computerization of business and state institutions (including the online openness of government data) in Europe. In this respect the most digitalized countries on the continent are the Scandinavian states and Holland. Great Britain, Luxemburg, Belgium, Ireland, Austria, Estonia, Malta and Germany are just behind these leaders. The average rate of digitalization is, amongst others, in Slovakia and the Czech Republic, while the lowest rate is in Italy, Croatia, Cyprus, Greece, Bulgaria, Romania, Poland and Hungary. However there is still a difference between these last two countries: Poland has the faster and Hungary has the slowest pace of digitalization. That means that at least for Poles the technological gap may decrease in the future.[37]

3.4 Comparative strengths and weaknesses of Poland

The participants were also asked about the strengths and weaknesses of Poland in the context of the adoption of new technologies. As regards the former (**strengths**), the respondents identified the following aspects:

- **high quality of tertiary education in science** – especially in the field of IT studies;
- Poles' **ability to learn fast** (which shall be understood in a broader context – as an ability to adapt to a rapidly changing socio-political situation that stems from historical circumstances);

[35] Lamża, Ł (2018), "Sztuczna przeciętność", Tygodnik Powszechny, 9 September 2018, p. 77.
[36] McKinsey & Company, (2016), "Cyfrowa Polska", 2016, p. 10-19, at: http://mckinsey.pl/wp-content/uploads/2016/08/Cyfrowa-Polska.pdf.
[37] Arak, P. Bobiński, A (2016), "Czas na przyspieszenie. Cyfryzacja gospodarki Polski", Warsaw 2016, At: http://zasoby.politykainsight.pl/politykainsight.pl/public/Czas-na-przyspieszenie--Cyfryzacja-gospodarki-Polski.pdf.

- a high percentage of the society with **a university degree**[38];
- universal **access to Internet**;
- a high level of **entrepreneurial spirit** in the society;
- the presence of **foreign capital investment in new technologies**.

On the other hand, as regards the latter (**weaknesses**), the majority of respondents identified the following factors:

- insufficient competences of **public administration officers**;
- **few national companies with the potential to innovate that operate on a European or global market**;
- the low quality of the legal environment and the **increasing number of existing regulations**;
- **limited technical expertise/awareness among the prospective investors/patrons of innovative enterprises**;
- **anachronistic tender procedures** in public administration that **favour the cheapest offer instead of the most innovative one**;
- **obsolete management practices** employed by enterprises and public administration;
- **insufficient use of new technologies in primary schools**[39] and an archaic approach to teaching (aversion towards risk taking and unconventional thinking – one of the participants even stated that "Polish schools teach the youth to fear the unknown instead of promoting openness and exploration").

3.5 Predictions

The survey participants were also asked to share their predictions as regards adoption of new technologies for the years 2018-2030. **Three quarters of all respondents stated that start-ups that provide financial services based on IT (the so-called fintech) will in this period constitute an alternative to the existing banking sector.** The respondents differed, however, in their expectations towards the role of Germany in these processes. The same percentage of participants (app. 40%) observed that Berlin plays a significant role in the technological transformation of the V4 group or that its economic ties to other states in the region will weaken (the growing automation of the German economy will result in a reduced demand for cheap labour from Central and Eastern Europe). A similar percentage of respondents believes that new technologies will limit employment opportunities and will thus pose a threat to social cohesion.

Nevertheless, not all prognoses were equally pessimistic. **Almost a half of all respondents was convinced that Poland is on its way to becoming a cradle of start-ups that have the potential to be successful also in other Visegrad states** (however, another inconsistency occurs here; earlier, the respondents declared that they lack sufficient knowledge as regards V4 countries), **and that the state will become cashless** (all payments will be digitized). An equal percentage believed that **the sharing economy will change the existing socio-economic models**.

The experts who completed the questionnaire were also asked to identify which technology has the **biggest potential to influence the Polish economy.**

[38] In 2012, 32% of people in Poland had a university degree (sample group aged between 25 and 64 y.o.): Puls Biznesu (2012) "10 najbardziej wykształconych krajów świata" (2012), Pb.pl, 30 September 2012, at: https://www.pb.pl/10-najbardziej-wyksztalconych-krajow-swiata-686603.

[39] However some progress here is worth noting. The Ministry of National Education and the Ministry of Digitalization are introducing a special program aiming to connect every school in Poland with fast Internet. The project has been widely praised winning the "World Information Summit on the Information Society Prize" in 2018. See more: WSIS Prizes 2018 (2018), Itu.int, at: https://www.itu.int/net4/wsis/prizes/2018/.

Three quarters of the surveyed experts recognized cashless payments as such a factor, while **a half of participants highlighted drones. One quarter of all respondents saw such a potential in artificial intelligence (AI).** Only one participant mentioned driverless cars, blockchain, or alternative energy sources.

The last questions devoted to prognoses dealt with the impact of new technologies on the activities of the company or institution in which the respondents work. **None of the experts expressed anxiety about his/her current position becoming obsolete**. However, there were some differences in the extent of the expected changes – one fourth of all respondents predicted significant changes would occur, a half anticipated small changes, whereas one in every four respondents believed that their current duties and role would stay the same for the most part.

3.6 Obstacles to development, structural changes and recommendations

The final section of the basic part of the questionnaire dealt with recommendations for what the state should change or simplify in order to further enable the development of new technologies. Among the most common answers to the question about **the biggest obstacles to the development of new technologies in Poland,** the experts listed:

- **anachronistic public procurement law**;
- underestimating the importance of computerization and automation in public services by the government;
- **restrictive regulation** and state bureaucracy;
- **a fast pace and unpredictability of legal changes** (passing legal acts overnight with no social consultations is regarded as typical of the current government dominated by the Law and Justice party);
- **limited openness of the internal market (some of the bigger state-owned enterprises have not yet been privatized** – on the pretext of their alleged strategic role in the economy; at the same time, these enterprises face a significantly limited competition, which leads to decreasing the market-driven need to innovate and thus reducing the potential costs and price of the products or services they offer);
- **labour unions hold a strong position**; as such, they try to limit entrepreneurial freedom.

In this section, the respondents were also asked to identify **the key structural changes that should be introduced** in order to overcome the obstacles to further expansion of new technologies. These, according to the respondents, included chiefly:

- a wider application of **computerization of the already existing commercial solutions in the country (e.g. banking platforms) instead of attempting to create new governmental systems**, which so far have either not always been fully developed, or not been very user-friendly (e.g. Electronic Platform of Public Administration Services, ePUAP);
- **rebuilding social trust** (low social capital has been further eroded by extreme political polarization – the conflict between the parties, and ideologies, has spread from the parliament to public administration, enterprises, and even families);
- liberalization of business law and **further privatization of the economy**;
- changing the mindset in **operating public administration (a shift towards being more pro-citizen**, instead of seeking incomplete or faulty documentation that results in penalizing such shortcomings); better

coordination and cooperation between the respective ministries as regards implementing new digital projects.

The penultimate question in this section was devoted to the **ways in which the state should assist in introducing new technologies and developing the knowledge-based economy.** Here, the respondents identified chiefly the following solutions:

- **investing in education** (not only of children and the youth, but **also of adults);**
- **free-of-charge counseling** and consultancy for people who want to start a business;
- implementation **grants for start-ups**;
- **tax relief**;
- programs for **pairing the most talented students with big projects** (both governmental and from the private sector) that introduce new technologies.

However, **the experts were not of the same mind as regards the abovelisted solutions**. Some of them **questioned the effectiveness of grants and tax relief.** There even appeared more radical voices, according to which the best way for the state to assist enterprises – which applies also to the high-tech sector – would be **a complete withdrawal of the state from its involvement in the economy** and making room for the free market to stimulate innovation (one responded stated: "**I cannot identify any one thing that the state does well**").

FINANCES, INTERNET, INDUSTRY AND TECHNOLOGY

One respondent identified **the growth potential of cashless payments in Poland**. Currently, this type of transaction amounts to over 30% of retail sales in the country. According to the said expert, **Poles like any novelties in the financial sector** (e.g. Poland was the leading market for the introduction of the PayPass technology), **while the government also supports cashless transactions** (hoping to reduce the gray zone) by introducing an incentive program for public administration institutions. In the opinion of the interviewee, there is **a strong likelihood of completely shifting to cashless payments by the year 2030.**

Furthermore, another respondent stated that **the development of fintech will contribute to an increase in competition on the financial market, thus forcing traditional banks to both improve the quality and reduce the cost of the services they provide.** At the same time, the respondent was openly skeptical of the usefulness of governmental online platforms for completion of tax returns or social security forms. **The lack of market competition vis-à-vis state institutions and unclear, archaic rules for selecting contractors result in low quality state run applications**. Moreover, one of the surveyed respondents believed that the solutions promoted by fintech improve the efficiency of banking systems. However, at the same time, he expressed his concern for the fact that such innovative enterprises and the technologies they develop might be taken over by some of the major players on the market.

When asked about the development of the Internet in the age of "Industry 4.0", the same expert pointed out that **the Polish society lacks awareness of the potential threats posed by cybercrime** and that it is susceptible to propaganda and fake news on the Internet (mostly in social media).

The analyzed questionnaire included also a series of optional questions, where the participants had an opportunity to express their opinions on the impact of new technologies on industry. Here, it is worth mentioning the issue of the risk of raising unemployment rates, which might be a consequence of technological transformations taking place in industry. As pointed out by one of the experts:

„Poland is one of the countries that are most susceptible to labour-shedding that is a result of increasing automation. Various reports show that in the next 30 years around 10-49% of job places in Poland might be affected by automation. On the one hand, it is an opportunity to improve the effectiveness of the Polish economy […]. On the other hand, it poses a threat to the labour market and creates the risk of transferring some investment operations outside of Poland. Maintaining cooperation with Germany is the key in order to be able to participate in the digital revolution – we have too few global companies that invest in new technologies. We could, however, become the cooperating partners of our German counterparts. We have good graduates of technical and natural science universities – it is crucial that their talents are further developed by working for the companies that are global trailblazers in the application of new technologies".

Undoubtedly, **shifting the Polish economy from a model based on cheap labour that performs relatively simple tasks towards a model based on advanced knowledge presents a great challenge**. As has already been mentioned in the opening study of our project, this issue is well recognized also by the Polish political elites. The discrepancies are related chiefly to selecting the most appropriate solution.

START-UPS ENVIRONMENT

When discussing the Polish economy environment and the support (or lack thereof) it offers to the development of innovative business endeavours (including startups), the respondents emphasized the **role of a stable and predictable legal basis. The current political climate in Poland constitutes in this regard a clear threat.** On the other hand, **a relatively low saturation of the market with startups and the potential of well-educated technical university graduates** who enter the market appear to be an opportunity. The respondents who participated in the additional part of the survey were **skeptical of the effectiveness of potential state subsidies for innovative businesses.** According to our interviewees, **the state should only create a hospitable legal infrastructure, whereas creating and financing startups should be left to the free market.** One of the surveyed experts suggested that one of the initiatives **worth launching by the state would be creating a "startup valley" (a business incubator for companies also from other V4 countries) modeled on "Station F" in Paris, or similar solutions that may be observed in the United States or Israel.**

TECHNOLOGY AND TRANSPORTATION

Moreover, **the participants had doubts whether in the forthcoming years the transportation sector in Poland will experience any changes**. One of the interviewees emphasized the importance of the introduction of driverless cars (accompanied by labour-shedding that might affect professional drivers), whereas another one put an even greater emphasis on the so-called sharing economy in transportation – especially in Polish cities. Renting cars could substitute (at least to some extent) for owning a car, which might, in turn, lower the demand for parking spaces, but at the same time might result in changing the structure of personal budgets and customer purchasing habits (the existing car maintenance expenses might be eliminated altogether).

ADDENDUM ON APPROACH OF POLISH AUTHORITIES

It is also worth mentioning – as an additional explanation of the results of the survey – that there are **various opinions on the technological changes among the Polish authorities.** For instance, **Prime Minister Mateusz Morawiecki is famous**

for his enthusiastic attitude towards new technologies. As such, he perceives the fourth industrial revolution as an opportunity for Poland to join the global leaders in this regard.[40] During his numerous public appearances – even earlier, as a former Minister of Finance – he has announced launching a wide-reaching support program for innovative business solutions. Meanwhile, more concerns and skepticism have been exhibited by Professor Andrzej Zybertowicz, a close adviser to President Andrzej Duda, who even postulates "a technological moratorium" (which shall slow down the pace of technological transformation so that it does not spin out of control).[41] He also emphasized the unpredictability of the process of the development of new technologies – especially AI – and pointed out the dangers that stem from this phenomenon and which might affect not only the economy, but also humans as a biological species.[42] Such differences in stances are a manifestation of a curious tension that exists in the right wing in Poland – **a tension between the desire to take advantage of an opportunity that provides to the economy the development of technologies, and a traditional lack of trust in changes that are brought about by progress.**

RECOMMENDATIONS FOR POLAND

Summarizing, the collected opinions of the experts lead to the following conclusions as regards recommendations for state policy towards adoption of new technologies:

- Creating a well-thought-out **education system** for both the youth and adults. A system created in cooperation with practitioners that would teach unconventional thinking and encourage taking business risks, and which would foster open and exploratory attitudes.
- Providing a favourable **legal and institutional environment** for operating businesses. This means a clear, stable, and predictable legal system accompanied by hospitable (assistance-oriented) public and local administration. This means also compliance with the legal standards of other EU member states (to ensure that Poland remains within the EU legal environment and maintains the separation of powers).
- **Retaining an open market** that enables international cooperation, and remaining a part of a greater community – which in the case of Poland means the European Union. Isolation, national and cultural homogeneity, barriers – both customs and mental (e.g. prejudice, historical resentment) – are the enemy of technological progress.
- **Rebuilding social capital.** The low level of trust and the stark political conflict that is nowadays tearing apart the Polish society is bad for technological innovation. Moreover, it might prompt the most talented individuals to emigrate.

The ongoing debates on the technological changes and the need to adapt the economy to the age of the so-called "fourth industrial revolution" give the impression that the sheer longevity of the process – that should most likely be envisaged in decades, and not merely months or years – remains highly unappreciated. Needless to say, **it becomes obvious that the discussed shift of the economy structure cannot be decreed so that thousands of blue-collar workers, who constitute the driving force of industry in Poland, would start setting up start-ups over night.** The process of adapting the country and its economy

[40] Forbes (2017) "Morawiecki: Polacy mają gen innowacyjności. Możemy być potęgą high-tech w 2030 roku", Forbes, 9 November 2017, at: https://www.forbes.pl/gospodarka/morawiecki-polska-moze-byc-potega-high-tech-w-2030-roku/x2sqgbe.
[41] Sułdrzyński, M. Zybertowicz, A. (2018) "Sztuczna inteligencja wszystkich nas ogra", Plus Minus (a supplement to the Rzeczpospolita daily), 13-14 January 2018.
[42] Ibid.

requires long-term and multifaceted planning that goes beyond the electoral agenda and current political conflicts.

3.7 Best practices

The last question of the main part of the survey featured a request to provide **examples of good practices that might be implemented also in other V4 countries**. Here, the respondents mentioned the example of a **successful employment of webportals of commercial banks for communicating with the state** (e.g. for distribution of social benefits). As emphasized by one of the participants, "employing a familiar interface of a bank and banking security systems is far more efficient and safe than creating a dedicated governmental webportal". Another noteworthy example of a good practice is **the story of Comarch, a Polish IT company** (referred to by one of the respondents as **"a model example of cooperation between science and business sectors")** or **innovative degree courses offered by Cracow University of Economics** (e.g. The Future of Global Business Services), which are based on the expertise of practitioners employed by foreign companies.[43] On the other hand, **almost one quarter of all respondents claimed that they do not know any examples of the ways in which the Polish state assists in implementing new technologies that would be worth emulating.**[44]

[43] See: Konowrocka, D (2012), "Jak wygląda współpraca uczelni z firmami IT", Computerworld.pl, 20 March 2012, at: https://www.computerworld.pl/news/Jak-wyglada-wspolpraca-uczelni-z-firmami-IT,380789.html.

[44] Some interesting alternative to the government's initiatives is the Smart Factories project implemented – at the request of the European Commission - by the consulting firm PWC in co-operation with Oxentia (Oxford's Global Innovation Consultancy). The main objective of the project is creating a network of so-called Digital Innovation Centers that help businesses in manufacturing processes including developing digital products and services (mostly through access to technology, financial support, market analysis and networking). The initiative is intended for new member states of the EU including all V4 countries. See more: "Smart factories in new Europe – PwC to help set up Digital Innovation Hubs as part of the EU Digitizing European Industry initiative" (2017), Pwc.pl, 20 September 2017, at: https://www.pwc.pl/en/media/2017/2017-09-20-pwc-smart-factories.html.

4. Slovakia

Martin Reguli

4.1 Introduction

The Slovak approach in this chapter is based on a series of direct interviews supplemented by publicly available media interviews. As a result the chapter focuses on positions from experts from different sectors of the economy that have been active in the processes of automation or the transformation of labour and education processes. The list of those whose insights were reflected includes the following:

- In the form of personal interviews:
    - Michal Krčméry – Director of Government Affairs at the American Chamber of Commerce in Slovakia
    - PaedDr. Milan Kubiatko, PhD. – Department of Pedagogical Studies, Faculty of Humanities, University of Žilina
    - Róbert Chovanculiak – analyst of the INESS institute
    - Matej Beňuška - Public Policy and Government Relations at Taxify
    - 2 respondents wishing to remain anonymous
        - One from the chamber of commerce
        - One from a private web agency
- In the form of insights gained from media interviews
    - Gustáv Budinský – secretary of the IT Association of Slovakia (ITAS)[45]
    - Andrej Hutta – member of the presidium of the Federation of employers' associations of the Slovak Republic (Asociácia zamestnávateľských zväzov a združení SR – AZZZ) [46]
    - Mikuláš Luptáčik – Dean of the Faculty of National Economy of the University of Economics in Bratislava[47]
    - Martin Morháč - Chairman of the Board of Directors and Director of SOVA Digital[48]
    - Peter Ratkoš - Director and Executive Manager at APLI s.r.o.[49]
    - Peter Staněk - Researcher at the Economic Institute of the Slovak Academy of Sciences[50]

[45] Budinský, G. (2017) "Keď sa nezmení prístup vlády vo vzdelávaní IT špecialistov, Slovensko sa z technologickej krajiny prepadne na montážnu dielňu", ITAS, 21st June, 2017, at https://itas.sk/ked-sa-nezmeni-pristup-vlady-vo-vzdelavani-it-specialistov-slovensko-sa-z-technologickej-krajiny-prepadne-na-montaznu-dielnu/

[46] Odkládal, M. (2017) "Školy bez kvality treba nekompromisne zrušiť (rozhovor)", Aktuality.sk, 12th June 2017, at https://www.aktuality.sk/clanok/495795/skoly-bez-kvality-treba-nekompromisne-zrusit-rozhovor/

[47] GoodWill (2017) "Priemysel 4.0 a Slovensko: ako sa udržaž medzi elitou", GoodWill, at https://docs.google.com/viewer?a=v&pid=sites&srcid=YXNvY2lhY2lhcHouc2t8YXNvY2lhY2lhLXB6fGd4OjE5YTM2ZWUwNjA1MTQoZWU and Engineering Magazine (2018) "Slovensko je špička v raste productivity práce, potrebuje však viac", Engineering Magazine, at https://www.engineering.sk/clanky2/veda-vyskum/2932-slovensko-je-spicka-v-raste-produktivity-prace-potrebuje-vsak-viac.

[48] Zisk manažment (2018) "Priemysel zásadne zmení trh. Šikovní to využijú", Zisk manažment, 6th March 2018, at http://www.ezisk.sk/clanok/priemysel-4-0-zasadne-zmeni-trh-sikovni-to-vyuziju/4322/.

[49] Bložon, B. (2017) "Priemysel 4.0 je riadenie ekonomiky v reálnom čase", ATP Journal, 12th April 2017, at https://www.atpjournal.sk/rubriky/rozhovory/priemysel-4.0-je-riadenie-ekonomiky-vrealnom-case.html?page_id=24811.

- Alexander Matušek – representative for Think Blue.Factory at Volkswagen Slovakia
- Dušan Dvořák - Head of Communication and Public Relations, Kia Motors Slovakia
- Peter Švec – spokesperson, Groupe PSA Slovakia[51]
- Jozef Kollár – president of the Confederation of Trade Unions[52]

4.2 Expectations about the future importance of new technologies

The first part of the questionnaire was directed towards the experts' expectations about the near future and the impact of digitalisation on the Slovak economy. Out of the experts approached, four are expecting that during the period of 2018-2030 new technologies will change our lives faster than ever before. This shows that there is a widespread expectation that there will be an unprecedented rate of adoption of technological advances compared with previous experiences. Similar sentiments have also been presented by experts who have voiced their opinions in Slovak magazines. According to Martin Morháč from the company SOVA Digital, the process of digitalisation will be accelerating in the coming period.[53] Significant developments in the economy are expected also by the ITAS (the IT Association of Slovakia), which expects that the Slovak economy will require increasingly more IT experts due to the quick adoption of digitalisation in areas of the economy. [54] According to Mikuláš Luptáčik from the Economics University, the Industry 4.0 revolution is already bringing its effects into the Slovak economy. Increased competitiveness should be brought about not just through lower wages (as has traditionally been the case), but also by the high technological level of the machinery.[55] Professor Staněk from the Slovak Academy of Sciences, voiced his opinion claiming that the next decade will be a decade of radical changes in production, consumption, recycling, customer communication as well as the philosophy of the financing of such projects.[56] Lastly, the opinion of the trade unions, has been voiced by the chairman of the Confederation of the Trade Unions, Jozef Kollár, who said that digitalisation might weaken social protection, mainly due to the potential threat of job losses that digitalisation brings.[57]

[50] Parlamentné listy (2018) "Profesor Staněk predstavuje možnú blízku budúcnosť: Nová spoločnosť, nájdenie zmyslu života. Zdá sa vám to príliš? Veď čítajte", Parlamentné listy, 5th March 2018, at https://www.parlamentnelisty.sk/arena/rozhovory/Profesor-Stanek-predstavuje-moznu-blizku-buducnost-Nova-spolocnost-najdenie-zmyslu-zivota-Zda-sa-vam-to-prilis-Ved-citajte-298342.
[51] Bložon, B. (2017) "Priemysel 4.0 je riadenie ekonomiky v reálnom čase", ATP Journal, 12th April 2017, at https://www.atpjournal.sk/rubriky/rozhovory/priemysel-4.0-je-riadenie-ekonomiky-vrealnom-case.html?page_id=24811.
[52] Tasr (2016) "J. Kollár: Odbory v EÚ musia vidieť v digitalizácii nielen hrozbu", Teraz.sk, 17th March 2016, at https://www.teraz.sk/ekonomika/kollar-odbory-eu-digitalizacia/187398-clanok.html.
[53] Zisk manažment (2018) "Priemysel zásadne zmení trh. Šikovní to využijú", Zisk manažment, 6th March 2018, at http://www.ezisk.sk/clanok/priemysel-4-0-zasadne-zmeni-trh-sikovni-to-vyuziju/4322/.
[54] Budinský, G. (2017) "Keď sa nezmení prístup vlády vo vzdelávaní IT špecialistov, Slovensko sa z technologickej krajiny prepadne na montážnu dielňu", ITAS, 21st June, 2017, at https://itas.sk/ked-sa-nezmeni-pristup-vlady-vo-vzdelavani-it-specialistov-slovensko-sa-z-technologickej-krajiny-prepadne-na-montaznu-dielnu/.
[55] Engineering Magazine (2018) "Slovensko je špička v raste productivity práce, potrebuje však viac", Engineering Magazine, at https://www.engineering.sk/clanky2/veda-vyskum/2932-slovensko-je-spicka-v-raste-produktivity-prace-potrebuje-vsak-viac.
[56] Parlamentné listy (2018) "Profesor Staněk predstavuje možnú blízku budúcnosť: Nová spoločnosť, nájdenie zmyslu života. Zdá sa vám to príliš? Veď čítajte", Parlamentné listy, 5th March 2018, at https://www.parlamentnelisty.sk/arena/rozhovory/Profesor-Stanek-predstavuje-moznu-blizku-buducnost-Nova-spolocnost-najdenie-zmyslu-zivota-Zda-sa-vam-to-prilis-Ved-citajte-298342.
[57] Tasr (2016) "J. Kollár: Odbory v EÚ musia vidieť v digitalizácii nielen hrozbu", Teraz.sk, 17th March 2016, at https://www.teraz.sk/ekonomika/kollar-odbory-eu-digitalizacia/187398-clanok.html.

On the other hand, two of the experts contacted through the interviews opted for the choice that in the period referred to new technologies will change our lives, but the changes will be comparable those witnessed in previous decades. These two experts come from the sector of start-ups, which may explain their preference of answer as they may see the current state of affairs in their field as already heavily influenced by the large-scale changes in their sectors over the past years. This has led the representative of the employers' association (the Federation of employers' associations of the Slovak Republic) Andrej Hutta to claim, that Slovakia cannot afford to wait any longer with the reform of education, as for the past 25 years nothing has really changed in the education system.58 This shows that the urgency of the issue in front of Slovak public officials is rapidly growing. Thus, even despite this slight difference in answers it is possible to confidently state that **across the field of experts there is a serious level of understanding that the future of the Slovak economy holds dramatic changes for people's lives and for economic production.**

4.3 Global pace of adoption of new technologies from Slovak perspective

Out of the interviewed experts, only four were confident to put the rate of progress of Slovakia as comparable with other countries. When looking at the evaluations given by the experts, we can see that 2 of the experts have defined the progress of the adoption of V4 countries as slow, while 2 of the experts have evaluated V4 countries as having an average rate of progress. This shows a perhaps **relative consistency in the view that V4 countries are below average or average at best in terms of their expected rate of adoption of the new technologies in the private and public sector.** However, expectations in terms of other countries vary greatly among the respondents. This discrepancy may signal that different experts have varying faith in different countries' capacity to be the leader in digitalisation.

Overall, there is an agreement among the respondents that **the two leading countries in terms of the pace of adoption of new technologies will be the United States and China.** These countries are seen as the overall leaders in technological advance and the adoption of new approaches in the industry. The reasons why these countries often have the advantage, may stem from **the quality of the high school education system.** This has been voiced by experts in printed articles, namely Mikuláš Luptáčik who claimed that the higher quality of high schools in China are key for the economic success of the country and the development of industry.[59] Similarly USA and Germany are seen by Peter Staněk as leaders, which have been providing prognoses regarding the pace of the changes ahead.[60] Germany was also popular among the respondents in the interviews, three of whom expect Germany to be a fast adopter of new technologies. This has been reaffirmed by representatives of the Slovak automobile industry, namely the representative of Kia Motors Slovakia (Dušan Dvořák), who claimed that **Germany is already in the position of being the destination of the outsourcing of IT**

[58] Odkládal, M. (2017) "Školy bez kvality treba nekompromisne zrušiť (rozhovor)", Aktuality.sk, 12th June 2017, at https://www.aktuality.sk/clanok/495795/skoly-bez-kvality-treba-nekompromisne-zrusit-rozhovor/.

[59] Engineering Magazine (2018) "Slovensko je špička v raste productivity práce, potrebuje však viac", Engineering Magazine, at https://www.engineering.sk/clanky2/veda-vyskum/2932-slovensko-je-spicka-v-raste-produktivity-prace-potrebuje-vsak-viac.

[60] Parlamentné listy (2018) "Profesor Staněk predstavuje možnú blízku budúcnosť: Nová spoločnosť, nájdenie zmyslu života. Zdá sa vám to príliš? Veď čítajte", Parlamentné listy, 5th March 2018, at https://www.parlamentnelisty.sk/arena/rozhovory/Profesor-Stanek-predstavuje-moznu-blizku-buducnost-Nova-spolocnost-najdenie-zmyslu-zivota-Zda-sa-vam-to-prilis-Ved-citajte-298342.

infrastructure from the countries of Central Europe.[61] Other countries that were highlighted by the majority of respondents were the United Kingdom and France. There were disagreements about the position of Japan and Russia, which managed to appear as fast adopters in some of the questionnaires but also as slow adopters in others. Weak adoption is expected in India, which may be associated with the lower participation of the population in secondary education. This, according to the experts, is important in determining the success of countries due to the faster rate of popular adoption.[62]

4.4 Comparative strengths and weaknesses of Slovakia

STRENGTHS

Despite the overall weak perception of Slovak readiness for and future adoption of digital technologies, the interviewed experts have identified a certain **set of strengths that Slovakia has in comparison with our closest competitors.** The main positives of Slovakia have been defined as the following:

- Positive examples of **tech-oriented start-ups** as well as **foreign investors** expanding their operations in Slovakia into higher value-added jobs (technology centers, R&D centers, etc.);
- **Relatively small size of the country's administration** makes it possible to **reform** and adapt much faster than large economies;
- **High penetration and relatively cheap access to fast internet and mobile internet**;
- Possibility to create **a space for new firms**;
- Growing adoption of ecommerce, **small population (being a small country is good for testing new technologies** – many corporations are testing new technologies in Slovakia).

This shows that Slovakia offers companies a relatively accessible market with a limited size, which is prepared for quick penetration of a product or a service due to solid internet connections and the existence of technology-oriented start-ups. This makes Slovakia a country where changes could be implemented quickly by large companies.

To add to this Slovakia has a strong presence of automobile companies, which have been leading the discussion in digitalisation by pushing new technologies into their production. This has been confirmed by the representatives of three major car companies in Slovakia. One of the main reasons is that their mother companies are providing the resources and know-how necessary to quickly implement the technology transition.[63]

WEAKNESSES

The other side of the coin are the weaknesses, which may stand in the way of the quick deployment of technologies in Slovakia. As was shown above, Slovak experts often have **limited expectations about the capacity of Slovakia to react quickly**

[61] Gérer, A. (2018) "V slovenských automobilkách je Priemysel 4.0 realitou", ATP Journal, 9th May 2018, at https://www.atpjournal.sk/rubriky/rozhovory/v-slovenskych-automobilkach-je-priemysel-4.0-realitou.html?page_id=26889.

[62] Engineering Magazine (2018) "Slovensko je špička v raste productivity práce, potrebuje však viac", Engineering Magazine, at https://www.engineering.sk/clanky2/veda-vyskum/2932-slovensko-je-spicka-v-raste-produktivity-prace-potrebuje-vsak-viac.

[63] Gérer, A. (2018) "V slovenských automobilkách je Priemysel 4.0 realitou", ATP Journal, 9th May 2018, at https://www.atpjournal.sk/rubriky/rozhovory/v-slovenskych-automobilkach-je-priemysel-4.0-realitou.html?page_id=26889.

to the new challenges. The reasons have also been summed up through the interviews:

- **Low support of government in the adoption process of new technologies.** This is associated mainly with the lack of comprehensive action from the public sector (both at central and regional level) mainly in the areas of:
    - **Education** – lack of reform activity towards secondary and tertiary education, which stand at the root of many problems;
    - **Entrepreneurship** – slow development of pro-SME policies;

- Lack of lawmakers that want to bring innovative change;
- Low level of investments in R&D;
- Bureaucratic burdens in the form of regulations.
- Generally low IT-skills among the population;
    - This leads to a growing gap between demand for IT pros and the supply of IT professionals by universities, a steady downgrading of the quality of science education at primary and secondary schools, a bad reputation of IT projects in state agencies paid through the public sector mainly due to low efficiency and failing to reach the goals,
- Language (**the Slovak language is very different from English**, where new technologies are developed – e.g. speech recognition & synthesis);
- **Not enough IT companies supporting universities**;
- Negative PR by **the state against cryptocurrencies**.

These weaknesses are very much voiced also by the experts interviewed in the printed press. Basically **the main problem that Slovakia cannot ignore for much longer is education reform**. The body ringing the alarm bells the loudest is the Slovak association of IT companies ITAS. Its secretary Gustáv Budinský claims that unless Slovakia acts now, the country will change from the technology leader in the automotive and IT sectors to an assembly factory.[64] These strong comments are not surprising. **Slovakia is losing in the different international competitiveness rankings**, which are based on objective factors about the economy combined with an evaluation by the managers of major companies in the country. For this reason, the Trade Unions in Slovakia have been pushing for changes in the education system to be oriented to IT capacities and overall skills development.[65] This is also voiced by the representative of the Federation of employers' association, Andrej Hutta who claims that **the school system is based on preconditions that were valid 25 years ago.**[66] This means that the number of schools needs to be lowered, due to the demographic curve and changing market demands for qualified employees. The third expert voicing this message is the Dean of the Faculty of National Economy of the University of Economics in Bratislava Mikuláš Luptáčik. In his opinion, the key weakness is the deterioration of secondary education, which is the backbone, mainly in the area of vocational education.[67]

[64] Budinský, G. (2017) "Keď sa nezmení prístup vlády vo vzdelávaní IT špecialistov, Slovensko sa z technologickej krajiny prepadne na montážnu dielňu", ITAS, 21st June, 2017, at https://itas.sk/ked-sa-nezmeni-pristup-vlady-vo-vzdelavani-it-specialistov-slovensko-sa-z-technologickej-krajiny-prepadne-na-montaznu-dielnu/.

[65] Tasr (2016) "J. Kollár: Odbory v EÚ musia vidieť v digitalizácii nielen hrozbu", Teraz.sk, 17th March 2016, at https://www.teraz.sk/ekonomika/kollar-odbory-eu-digitalizacia/187398-clanok.html.

[66] Odkládal, M. (2017) "Školy bez kvality treba nekompromisne zrušiť (rozhovor)", Aktuality.sk, 12th June 2017, at https://www.aktuality.sk/clanok/495795/skoly-bez-kvality-treba-nekompromisne-zrusit-rozhovor/.

[67] GoodWill (2017) "Priemysel 4.0 a Slovensko: ako sa udržaž medzi elitou", GoodWill, at https://docs.google.com/viewer?a=v&pid=sites&srcid=YXNvY2lhY2lhcHouc2t8YXNvY2lhY2lhLXB6fGd4OjE5YTM2ZWUwNjA1MTQoZWU and Engineering Magazine (2018) "Slovensko je špička v

What to take from this discussion? While in the early 2000s Slovakia managed to position itself as a country of reforms this era seems to be over. In order to remain competitive, Slovakia needs to rediscover the push from the past to be a country of change and needs to make the most of the opportunities offered by the European market.

4.5 Predictions

The obvious starting point to figure out the best practices that could be followed is the question of where Slovakia is heading. Perhaps unsurprisingly, **it is quite difficult to find a consensus about this among the experts.** The answer depends on their own perspective, field of profession and the stakes for their institution. Generally speaking, when the experts were asked, they picked from a predictable field of areas. According to the interviewed experts the main technological advances anticipated to bring positive changes to Slovakia are mainly:

- Cashless payments – identified by 2 respondents
- Artificial intelligence – identified by 2 respondents
- Autonomous cars – identified by 1 respondent
- E-commerce – identified by 1 respondent
- Sharing economy – identified by 1 respondent

These sentiments were voiced also by the interviewees in the Slovak press. Alexander Matušek, the representative of the Volkswagen Bratislava Think Blue Factory has detailed the focus of their factory as being directed at digitalisation, robotization, use of virtual reality and big data.[68] According to Peter Ratkoš, the director and executive manager at APLI Ltd., the future lies in robotization, which alongside artificial intelligence will make a lot of traditional work obsolete.[69]

4.6 Obstacles to development, structural changes and recommendations

The experts were further focused on either the direct barriers caused by government or factors that the government needs to change to make the transition forward possible.

- **Low support of government**;
- **Wasteful regulations**;
- **Laws need to be written in a more open way so new technology doesn't require changes upon entering the market**.
- **Lack of joint agreement amongst the most important stakeholders** on adoption of new technologies;

raste productivity práce, potrebuje však viac", Engineering Magazine, at https://www.engineering.sk/clanky2/veda-vyskum/2932-slovensko-je-spicka-v-raste-produktivity-prace-potrebuje-vsak-viac.

[68] Gérer, A. (2018) "V slovenských automobilkách je Priemysel 4.0 realitou", ATP Journal, 9th May 2018, at https://www.atpjournal.sk/rubriky/rozhovory/v-slovenskych-automobilkach-je-priemysel-4.0-realitou.html?page_id=26889.

[69] Bložon, B. (2017) "Priemysel 4.0 je riadenie ekonomiky v reálnom čase", ATP Journal, 12th April 2017, at https://www.atpjournal.sk/rubriky/rozhovory/priemysel-4.0-je-riadenie-ekonomiky-vrealnom-case.html?page_id=24811.

- **Generally low IT-skills among the wider population**;
- lack of private and public **investments into R&D** which can have the potential to bring innovation;
- **indifferent/negative perception of older generations (50+)**.

This shows that overall the main obstacles stem from the low rate of trust that the government has in the eyes of the population and the leaders of digitalisation in Slovakia. Three of the five mentioned concerns focused on the capacity of the government to rule in a way that is compatible with a thriving digital economy. Furthermore, the other concerns also focus on areas where an important element has been neglected by the government, namely education and the capacity to create an efficient framework for cooperation with the stakeholders.

The structural changes that should be made to overcome the obstacles are even more subject to differing perspectives of the experts:

- From the point of view of the legislation process – **fully adopt the sharing economy practices and allow the technologies to positively influence society. In addition, government should exert a strong influence on "marketing" of the technologies to those communities which are traditionally opposed to innovative changes**;
- A change of government to a more progressive government (presumably through increased involvement in innovation and education policies);
- **Educational reform**, a stronger focus on **IT skills** in the formal education curriculum, a stronger emphasis on **lifelong learning**, stimulation of private investments in R&D;
- Get rid of wasteful regulations;
- **E-Government needs to be instituted** as soon as possible.

The recommendations stress that the government should make changes in its approach to the development of practices suited for the sharing economy and digitalisation. The government needs regulatory reform and to implement e-government. Lastly, the reforms need to highlight new skills missing on the market at the moment, as they will be the key to making the transition a successful one.

The recommendations vary hugely also for the role of the government in the process of **the adoption of new technologies and the implementation of the knowledge economy**. They range from passive preparation of rules to active measures and direct involvement in creating technology centers to direct research:

- To **give more financial support (grants, funds)**
- Foresee the inevitable societal changes of technologies and **constantly update the current legislation to the most flexible and up-to-date state possible**
- Actively support the transformation of the economy from an industrial to a knowledge economy e.g. **differentiate when supporting investments, enable the use of technologies in public services**, promote adoption of new technologies by public institutions so that citizens can use them regularly
- **The state should run its own development/engineering centres** to be able to keep pace with today's IT giants
- **No state subsidies for IT research and projects, lower taxes, simple immigration for tech pros, a much higher wage for teachers of science at primary/secondary schools and technical universities, state IT projects chunked in small projects & open-sourced**.

4.7 Best practices

Lastly, some experts also gave **limited examples of what positive examples from Slovakia can be adopted in other countries**. They highlighted mostly:

- **The connection of the state and the business sector without any artificial appointment of political people**
- **The recent change in Investment Aid legislation means incentives will be directed towards investments creating higher value-added jobs**

These positive examples highlight the areas where Slovakia has started to move albeit slowly in a positive direction. It will be up to us to build upon these examples and share with the V4 countries their positive examples to make the most of our partnership.

5. Czech Republic

Kryštof Kruliš

5.1 Introduction

The analysis of the Czech discourse on adoption of new technologies in this chapter is based on a series of fourteen direct interviews with leading personalities of public administration, business, think-tanks, civil society and academia. Moreover, the views of the trade unions were also reflected from discussion at the informal working group initiated by the Office of the Czech Government on Artificial Intelligence which was attended by the author of the analysis.[70] Ideas on modernization and digitalization of public administration were further drawn from a roundtable meeting of twelve IT specialists from the main Czech governmental departments, representatives of municipalities, civil society and business, which was also attended and chaired by the author of the analysis.[71] Finally, the chapter also reflects discussions at the initial roundtable of the Digital New Deal project in Prague,[72] and the roundtable on the sharing economy and smart cities in Brno,[73] both events chaired also by the author. The list of the directly consulted persons included the following:

- Ivan Pilný, Commissioner for Digital Education at Ministry of Education (ANO political movement)
- Aleš Chmelař, State Secretary for European Affairs (ČSSD political party)
- Jiří Krechl, Director R&D CzechInvest
- Ondřej Profant, Member of Parliament, Representative in City of Prague (Piráti political party)
- Petr Knap, partner Ernst & Young, Prague
- Roman Holý, National Centre for Industry 4.0, Czech Technical University in Prague
- Petr Beneš, 6D Academy
- Jan Macháček, Institute for Politics and Society
- Michal Hanák, Association for Internet Development (SPIR)

[70] The meeting of representatives of social partners and civil society convened by the Office of the Czech Government on 2nd of May 2018 in Herzánský palác, Prague, including Josef Středula (ČMKOS), prof. Michal Pěchouček (ČVÚT), Milena Jabůrková (Confederation of Industry), Alžběta Krausová (AV ČR) and Václav Kopecký (CEC).

[71] Spotřebitelské fórum (2018) "Modernizace státní správy. Program.", September 2018, at: http://spotrebitelskeforum.cz/wp-content/uploads/2018/09/Modernizace-st%C3%A1tn%C3%AD-spr%C3%A1vy_program.pdf.

[72] Kruliš Kryštof (2018) "Společnost 4.0 v české republice", Policy Paper AMO, June 2018, at: https://www.amo.cz/wp-content/uploads/2018/06/AMO_spolecnost-4.0-v-ceske-republice.pdf. The personalities present include Dita Charanzová (Member of European Parliament, ALDE/ANO), Ondřej Malý (Deputy Minister for Industry and Trade), Jaromír Novák (Chairman of the Council of the Czech Telecommunication Office), Michal Kadera (Director of Public Affairs, Škoda Auto, a.s.), Evžen Reitschläger (Association of Small and Medium Enterprises), Eva Bartoňová (Project manager for R&D CzechInvest) and Jiří Vacek (Economic Faculty, ZČU Pilzen).

[73] Kruliš Kryštof (2018) "Sdílená ekonomika v době chytrých měst", Policy Paper AMO, June 2018, at: http://www.amo.cz/wp-content/uploads/2018/07/AMO_sdilena-ekonomika-v-dobe-chytrych-mest.pdf. The personalities present included Luděk Niedermayer (Member of European Parliament, TOP 09/EPP), Jaroslav Kacer (Deputy Mayor of Brno for Smart Cities), Jan Edlman (Senior Project Manager of HoppyGo/Škoda Auto Digilab), Jaromír Klimek (Founder of AJO.cz carsharing), Ondřej Dufek (Flatio and Czech Sharing Economy Association), Petr Hlávka (Lumbio), Jiří Marek (Manager of Smart City Projects of City Brno), Tomáš Mejzlík (FabLab Brno, Inovation Centre of South Moravia) and Jan Tichý (Students for Liberty).

- Miroslav Lukeš, Mastercard
- Barbora Mičková, LEO Express
- Libor Manda, independent IT expert (formerly Seznam.cz)
- Ondřej Krátký, Liftago
- One representative of the group: Civil Society (labour unions and consumer protection groups), who desired to remain anonymous.

5.2 Expectations about the future importance of new technologies

The vast majority of interviewed stakeholders expressed a strong believe that **new technologies will be changing our lives (between 2018-2030) ever faster than in the past.** The rapid growth of computing capacity that has been achieved over the last decades was mostly mentioned as a reason for this believe. It was often stressed that the positive technological outlook of the next decade can only be threatened by currently unknown "black swans" which, however, by definition come as a surprise and thus cannot be predicted. The biggest enthusiasts even expressed it in the way that in recent years we have lived with new technologies in an old social and economic setting and we are now entering the era when technologies will become more and more apparent in our lives with all the attendant consequences for change. It was sometimes recognized, that social or ethical concerns may limit the spread of certain technologies, but technological progress will eventually find its place in our lives despite any obstacle legislators may erect in its way. Some technologies, like AI, may make current technologies more accessible to the broader part of society (by making them more intuitively predictive and user-friendly) and thus help in closing the so-called digital gap that now limits access to new technologies to people with certain abilities. One interviewee expressed a warning over the existence of many hypes (overstatements of real value of certain new technologies) that are fed by the desire of firms that want to sell technologies for a higher price than the possible benefits justify and recommended caution in their acquisition.

5.3 Global pace of adoption of new technologies from the Czech perspective

About half of the responses identified the **Visegrad Group (V4)** countries as performing at a similar pace, usually between the average and slow rate of adoption of new technologies. The remaining answers saw a certain differentiation in the V4. Most rated the Czech Republic as being in the regional lead, followed usually by Slovakia. Once, Poland was rated ahead of the rest of the V4 countries. Poland and Slovakia were also once praised for having made better progress in developing digital infrastructure at schools than the Czech Republic. Only a limited optimism for new technologies' adoption in our region was mostly explained with the still low access to domestic capital in our region. On the other hand, some stressed that our region has the potential to outperform other countries, including Germany, mostly due to the possibility of growth from lower technological levels. **France** was mostly considered as a slower adopter than **Germany,** which ranked between an average and a fast rate of technological adoption. **The United Kingdom** was mostly considered as the fastest adopter and the most promising start-up hub from the current members of the EU.

The **EU** as a whole was mostly considered as average and only occasionally as a fast adopter. The EU´s handicaps were often seen as self-limitation as far as GMO or protection of personal data concerns. Preservation of the high level of standards in the EU was sometimes seen at the same time as an advantage (guaranteed progress whilst reflecting the worries in society) and as a disadvantage (self-limitation in certain fields of scientific advances). In one interview the EU´s

approach was seen as legislating for possible future threats and problems (including the EU´s GDPR legislation) that may pay off in the future.

Russia was mostly rated with the lowest rate of new technology adoption. Only once, an argument appeared stressing that Russia can also perform at an average as a result of the necessity to develop their own solutions while being technologically less connected to the globalized world. Its domestic market cannot support creation of the leading technologies but could still be sufficient to employ a good number of developers and produce domestic start-up solutions.

The **USA** was mostly considered to be among the fastest adopters, mostly due to advancements of the private sector. The fastest rate of new technology adoption was, however, mostly connected with **China**. Some interviewees stressed that factories that were opened in China 5 or 6 years ago are now considered old in comparation with the newest ones, which is thinking far ahead of how we approach technologies in our region. Uncertainty in connection with China was sometimes raised due to its high diversity. Islands of modernity in China may be big, about several hundred million people, but they are still islands inside the sea of poor regions, as is also the case with India. China was, however, in one interview, recognized for doing better in spreading new technologies than India. The centralized Chinese regime was moreover considered as well suited for technology implementation and development of infrastructure but a lack of individual freedom will limit scientific breakthroughs and creativity there, which is indispensable for technological leadership.

5.4 Comparative strengths and weaknesses of the Czech Republic

STRENGTHS

The participants were also asked about the strengths and weaknesses of the Czech Republic in the context of the adoption of new technologies. The following **strengths** were identified:

- **Relatively strong society,** with good overall level of education and smaller wealth disparities than in most other countries around the world. It is now also complemented by the lowest unemployment in the EU. The Czech population thus may be more resilient in facing the digital gap and other possible related negative externalities connected with the advent of new technologies.
- **Possibility to grow from lower technological levels.** With the implementation of the latest technology (e.g. contactless credit cards that have larger penetration in Czechia than in most Western European countries), we can make a bigger leap forward and investment into new technology can make a much bigger difference from the current technological stage and thus also can be adopted earlier.
- **Population accustomed to transformation.** Since the beginning of the 1990s the Czech Republic has been undergoing a deep transformation of its public institutions and the functioning of its economy. People may see digitalization and new technologies as yet another step in this process.
- **Sound mindset and do-it-yourself spirit.** Both national "heroes" Josef Švejk and Jára Cimrman represent the Czech spirit in the sense that we are able to rely on our own abilities and do not lose our minds even under adverse circumstances. Czechs thus could find creative ways to live even with absurd regulations or will try to fix broken laboratory equipment instead of waiting for a specialist to come and help. The Czech workforce, from the tech industry to science or military personal, has a good reputation globally for this approach.

- **Industrial tradition.** A traditionally large industrial sector with the presence of most leading global firms, nanotechnology centres and a highly automatized automotive sector.
- **Digital Czech Republic is an accepted priority.** It may not produce visible outcomes immediately but overall most of the state departments understand that e-government must accelerate and become available for citizens in a user-friendly way.

WEAKNESSES

On the other hand, as regards the **weaknesses,** the majority of respondents identified the following:

- **Low level of domestic capital for substantial expansions.** Money in the start-up sector is plentiful and Czechs are good at creating embryo technological companies. However, when start-ups want to grow above the regional scale and seek capital for expansion, we have to rely on foreign investors and lose control over most of the equity which threatens the possibility of their future relocation or transfer of profits elsewhere.
- **Weak marketing.** A non-existent entrepreneurial sector during the Communist regime influenced our managerial abilities to sell our own products for the best price. Czechs pay big attention to improvements of production or logistics, but often omit marketing aspects that could yield bigger earnings for duly conducted work. New technologies also bring the **possibility to redesign existing business models**, e.g. providing engines as a service not for sale, or using the principles of the sharing economy. Without the proper marketing spirit Czech firms may not be able catch these new trends.
- **Underdeveloped infrastructure and countryside cut-off.** There are gaps in broadband internet coverage in areas where infrastructure is not commercially profitable and an inability to use EU resources for this purpose. This is aggravated by the fact that the Czech Republic has one of the highest number of municipalities of under 200 people. While digital technologies, cashless payments and functioning e-government could significantly ease life in the countryside and save enormous public and private costs, lack of broadband infrastructure together with the high price of mobile data may make these developments inaccessible to many.
- **State lacks priorities, has outdated legislation and is behind with user-friendly services that would be widely used by citizens.** The barriers of outdated legislation which is not ready for the digital age hinder the private sector and it has been argued that they also limit the public sector from development of properly functioning e-government. The state is also not able to guarantee a level playing field for local firms when facing global competition.
- **Slow changes in cooperation of schools and universities with business sector.** While some progress has been achieved, the available potential is still to be properly tapped. The system of elections by peers at universities does not put the best managers into leadership positions. Specialized centres at universities lack sufficient autonomy and their success is not always fully rewarded.
- **Size of the country.** The Czech Republic is too small to be a fully independent economy and does not have a sufficiently big market on its own, but too big to be a small progressive laboratory for new technologies as e.g. Estonia or Iceland. Support for the fully functioning Internal Market of the EU, including the Digital Single Market should thus be a priority.

5.5 Predictions

The survey participants were also asked to share their predictions as regards adoption of new technologies for the years 2018-2030.
Most of the respondents showed interest in new technologies in the financial sector but mostly did not believe that **fintech start-ups** will be able to constitute a viable alternative to the banking sector, which is highly regulated and depends on people´s trust in big banking houses. An exception to this would be in the case that big IT companies (e.g. Google, Amazon) got involved in the fintech industry. In such a case the established banking sector would face severe competition. Further, a **cashless society** was considered to be something we will approach in the next few years. Several of the respondents stressed that cashless payments, P2P money transfers or use of blockchain for transactions may in the future open immense new alternatives for business and even for new business models. Most of the interviewees were also optimistic both about the potential of the Czech **start-up sector** to show qualitatively the best outcomes in the region (for quantity Poland was recognized as the natural leader for the size of its economy) and about the possibility of starting a truly global IT firm in the Czech Republic. The latter was, however, mostly thought of with reference to cyber security giants that originally came from the Czech Republic but nowadays have a global shareholding structure. **Only two in fourteen respondents in the Czech Republic agreed that the EU has at least the potential to outperform the USA, Japan or China in digitalization**.

Cashless payments, Artificial intelligence and **Autonomous cars** were mentioned by almost everyone as the technologies that have the biggest potential to influence the economy in our country. Mention of Autonomous cars was mostly followed by an explanation, that it is due to the large share of the automotive industry in the economy and it is necessary to adapt in time our economic output to this technological change. **Blockchain** was mentioned by half the respondents. Electric cars and **3D printing** were also mentioned. On the other hand, drones and the hyperloop were considered as less likely. Several times it was stressed that the Czech dense habitation is an obstacle for the **hyperloop** and also that **drone delivery** has a handicap in Czech due to a lower percentage of residential family houses with gardens suitable for drone landing.

The last question was devoted to prognoses on the impact of new technologies on the activities of a company or an institution in which the respondents work. **None of the experts expressed anxiety about his/her current position becoming obsolete.** However, significant changes were expected in the consultancy sector due to automatization of certain tasks that will possibly result in redundancy of about one third of employees and possible changes also in business models in the whole sector.

5.6 Obstacles to development, structural changes and recommendations

The respondents were asked to identify **the needed key structural changes and state activities that should be introduced** in order to overcome obstacles for the further expansion of new technologies. These topics and recommendations were most often mentioned:

- **Legislation.** The state should secure a **stable** legislation that will **not stand in the way of modern technologies** (e.g. possibility of cashless shops, electronic identifications and registrations or professional taxi drivers using navigation apps instead of being examined for detailed knowledge of streets in a city) and which will secure an **even playing field for competition of global corporations with truly home-grown (endogenous) domestic firms.** The increasing regulatory burden (especially for SMEs) should always be offset with simplifications and a reduction of the existing

regulatory burden. Significant municipalities (e.g. with a population over 50.000) should be given broader autonomy in case they desire to open themselves up faster to new technologies and allow real life testing e.g. of autonomous cars in the streets or AI in eGovernment.

- **Taxation.** The current level of taxation is not a problem for business and investments if it is kept **stable and predictable**. However, new technologies and digitalized services may also pose new challenges for taxation as they may easily move between tax jurisdictions. The state and relevant multilateral organizations (EU, OECD) must find a way to tax online platforms in the jurisdiction where transactions were triggered and keep an even level of tax burden to preserve fair competition. **The solution does not consist in "taxation of robots" but in even taxation of alternative business ways, based on their outputs in each state.** Allowing **employee stock options with tax reliefs** is one way to increase motivation and the level of equity holding inside of our country.
- **Education. Directors at schools should be given broader competences without administrative burden**, including **renumeration** of good teachers and adoption of a **curriculum** focused on development of the ability to use new technologies, working in a team and supporting flexibility and multi-sectoral approaches. Mathematics and coding were also mentioned as a possible focus for curricula. **Schools and teachers should be evaluated on the learning outcomes of students with the use of international testing benchmarks**. Schools should focus more on the development of the talents of each individual, instead of aiming at average knowledge in inclusive classes. **Studying online** should be enhanced and incorporated in the educational system but state and/or universities should provide certification of quality and allow orientation in the achieved outcomes by employers. **The creation of a fund collecting donations from private companies and investing into modernization projects at schools (laboratories, modern equipment)** would ease the administrative burden for both donors and schools. **Universities should be managed by professionals selected and evaluated upon their managerial abilities instead of being elected solely by their peers.** Specialized centres at universities should be provided with broad managerial **autonomy**.
- **Industry.** The state should select strategic sectors and support development of clusters with an aim to attract technically demanding industries with the possibility to attract high wage jobs. This strategy should be complemented by a focus on how these sectors could be marketed and what profit they provide in terms of equity and provision of support for the preservation of equity in domestic hands (e.g. stimulation of employee stock options with tax reliefs). Defence procurements are the optimal way for a state to stimulate strategic technological sectors, e.g. cybersecurity or developers of AI. Selection of strategic sectors should also reflect future trends, e.g. aging of population or spread of automatization, and a focus on such industries as medical equipment, biomedicine, eHealth or social services, where jobs will most probably withstand automatization.
- **E-government.** Citizens should have an enacted right to approach the state and finish the whole transaction, including payment of fees, tariffs or tax, online. It must be a right, not a duty. The state should motivate people to use eGovernment with it being fully user-friendly, predictive and automated. The services of eGovernment should also have zero or the lowest fees from all the possible ways of contacting the state, as they also represent the lowest costs for state. Development of user-friendly eGovernment is a good way for the state to enhance a positive approach towards new technologies in the population.

- **Start-ups.** The primary way that the state can stimulate the start-up environment in the Czech Republic is by providing stable, predictable legislation that is not a barrier to new technology solutions (see above) and stimulate the population in support of new technologies by user-friendly eGovernment (also see above). Most of the respondents also saw more difficulties than positives in the state trying to invest in start-ups. Various start-up incubators and support of networking are positive and good for popularization but solving legislation and eGovernment would be much more beneficial. One specific suggestion was to offer free (paid for by the state) consultancy help by professionals (selected in an open public procurement competition) to start-ups in stateselected strategic sectors.

5.7 Best practices

Most of the respondents had difficulty identifying **examples of good practices that might also be implemented in other V4 countries.** Once the **transparency legislation** (e.g. availability of contracts of state and its entities, property disclosures of public officials) that has been implemented recently was mentioned with a belief that despite the additional regulatory burden it will pay off in the future. The **South Moravian Innovation Centre and the growing start-up environment in Brno** were mentioned several times as good examples of positive innovations. When questioning why it is so, there were suggestions that Brno is the second largest city in the country and the biggest which does not have limitations on drawing from EU cohesion funds (as Prague is limited as it has GDP per capita above the EU average). Moreover, it was also mentioned once that some of the strong sides, including a relatively highly educated population and high level of social cohesion (low level of unemployment and low share of people endangered by poverty) are the **results of long-term historical development and cannot be connected with one specific institution or policy of the state.**

6. The V4 region and new technologies

The V4 region is closely connected not just through common history and geographical closeness but its four countries can be also seen as laboratories trying different paths of economic policies on the transition from communist regimes. The four countries thus can learn from each other's successes and failures. The whole region is entering a new technological era at a similar level of technological development and shares similar tasks of how to prepare the educational system for new demands, how to properly modernize legislation and develop eGovernment or how to move their economies upwards on the ladder of added value and to what extent to use new technologies for this purpose. The V4 countries also represent potential partners that may have similar approaches to some policy issues discussed at the EU level. This, however, cannot be overestimated, as differences in size of their economies, levels of trade orientation towards Germany, the character of their exports and other diverging economic, political and social features may prevent finding a common V4 position. The V4 countries remain competitors and potential partners at the same time. A sharp regional competition over which country will attract better foreign investments is partly smoothed by saturation that presents with overall low levels of unemployment in the region and partly with acceptance that a large new investment e.g. in an automotive factory in one country, usually provides opportunities for suppliers from the whole region. Other V4 countries moreover often provide the closest external markets for first cross-border expansion of start-ups that attempt to grow beyond their original country. This is also one of the reasons why it makes sense to evaluate the entire V4 region in terms of opportunities it may provide for the growth of digital enterprises and potential burdens that SMEs will have to overcome.

The main **strengths** of the V4 region have been identified as the following:

- **Relatively well educated, disciplined and cheap workforce (in some cases currently almost fully employed, which further presses on implementation of new technologies)**;
- **Smaller size markets** (except Poland) that allow for testing and serving as "labs" for new products and technologies before introducing them to bigger markets;
- Population in V4 countries may seem rather conservative but at the same time the societies have been experiencing good growth over the last two or three decades and **new technologies are accepted as yet another step in the economic transition of the last decades**;
- The V4 countries **implement new technologies into an environment that is technologically less developed than in Germany and thus investments into new technologies can offer a bigger leap forward and a bigger productivity increase** and thus could also be adopted earlier. The V4 thus, for instance, can become cashless more quickly than some of the western economies (this can already be seen in the high penetration of contactless credit-cards in the region);
- The region has been open to **foreign direct investments** of global corporations for two or three decades which has brought **up-to-date know-how and simplified technology transfers;**
- Despite similarities the region offers a certain level of **variety, which stimulates specialization and individual countries can serve as laboratories of different regulatory and tax approaches** that are useful for testing of cross-border expansion.
- Mutual competition at least partly pushes towards improving conditions for the business environment (so far, unfortunately, mostly only in connection

with conditions offered to the biggest foreign investments). Nevertheless, this shows that the combined **approach of partnership and rivalry among the V4 countries is bearing fruit**.

The following **weaknesses** of the V4 region were also identified:

- **Bureaucratic burden that limits particularly SMEs** and lack of real political will to bring innovative changes of domestic regulatory system;
- General focus on industrial development rather than digital economy and development of new business schemes and opportunities. **The V4 countries still remain in the position of industrial rather than digital countries;**
- **Weaker north-south infrastructure which limits enhanced cooperation in the region and high population density that prevents or complicates development of new infrastructural projects** such as the hyperloop or even high-speed trains;
- **Insufficient domestic capital** that prevents preservation of equity in regional hands in the case that start-ups want to expand globally.
- **Deficit in market-oriented (managerial efficiency) way of thinking in the academic sector** and lack of regional cooperation in creation of highly specialized university centers that would serve for the whole region and thus increase their potential to gain a better position globally.
- **Unreasonably low self-confidence** and a media oriented towards self-criticism and political polarization. Overall weak political culture which does not yield a long term vision for the whole region.

7. The V4 region, new technologies and gravity of German economy

The questionnaire also focused on opinions of stakeholders on how the gravity of the German economy will influence the V4 economies in the future. It has been stressed on several occasions that while all V4 countries have Germany as their main trading partner, the level of economic linkage is not the same. The Czech Republic is interlinked with the German economy the most, primarily in the industrial sector. Slovakia, despite being more remote, is similar in this to Czechia and adoption of the euro keeps it close to Germany and the Eurozone. Poland is influenced by the size of its domestic market and the export of agricultural products and natural resources that are less dependent on technological connectivity. Hungary is in a similar position to Poland but cannot rely that much on its own domestic market.

The area of future energy sources was also mentioned as a point on which V4 countries diverge. Polish energy will still be provided by coal (partly due to employment concerns in the mining sector) and possibly by newly available imports of liquified gas. The Hungarian energy strategy was, from outside, considered as the most reliant on cheap supplies from Russia. Czechia and Slovakia will most probably remain dependent on nuclear power. All countries thus diverge from the German big shift towards renewable energy.

The gravity of the German economy and linkage to its industry in particular was stressed in the Czech Republic, and Slovakia but to some extent also in the remaining V4 countries. This gravity may be to some extent weakened by implementation of new technologies and the resultant lower need for an external cheap workforce in the German "nearshore". Caution is advisable as some companies may consider relocation of fully automated production back to Germany or in the case of deciding where to construct new capacity will decide to do it at home rather than in the V4 region. At the same time, relocating of existing production capacity is also costly and this process will thus be slow. It has also been stressed that placing production abroad is not motivated only by demand for a suitable labour-force, but also by externalities connected with movement of material in production and the necessary space. The latter motivation will remain even if full automation is reached.

A certain optimism was also expressed for the ability of the V4 region to become a diamond cluster of the automotive industry due to the high concentration of production capacities here which could benefit the creation of industrial solutions for exports as data from automated factories are a necessary condition for the development of new 4.0 industrial solutions. German technology was largely expected to dominate industries in our region. Some attempts to diversify sources of technological transfers into the region will bring technology also from the USA, Japan, South Korea or China, but the gravity of the German economy will most probably prevail due to the necessity of technological compatibility in supply chains. It has been also mentioned, that while Chinese investments cannot be omitted in the modern world, a certain level of caution with respect to intellectual property is still advisable when considering partnerships with China.

The service sectors in the region may be more open to diverse technological influences (not only from Germany) than the industrial sectors. At the same time, some of the services have even bigger territorial gravity as concerns as their consumers.

8. The V4 region, new technologies and the EU

Membership of the EU and its internal market in particular provides an important anchor for the whole region and allows transfer of technology and makes cross border expansion of start-ups much easier. The EU internal market is however not a complete project and it is in the interests of the V4 countries to push for its completion, including the Digital Single Market which still remains highly fragmented despite good steps prepared recently by the European Commission. The EU was also by some respondents considered as an organization that already focuses on possible future threats, e.g. in the case of use of personal data (GDPR). On the other hand, the solutions EU adopts may not always seem to fit the needs of the V4 region. For instance, the GDPR legislation could be seen from our region as unreasonably burdening SMEs, NGOs and ordinary citizens with administration with little actual benefit for users. Such legislation is then seen as shaped primarily to respond to the fears of foreign nations (Germany, in the case of GDPR) and this impedes its acceptance and practical implementation in the region. Some respondents thus recognized that regulatory attempts like GDPR may have good intentions but their delivery is far from optimal. It was also mentioned that the V4 region may be less obsessed with attempts to restrain big digital services companies from the USA. In the case of the Czech Republic and partly also in other countries in the region this is substantiated by more competitive on-line markets of e-commerce and digital services due to the existence of local platforms. On the other hand, the V4 region is less consistent in its approach to some other technological issues, such as GMO, with Hungary being one of the most vocal opponents to genetic modification in the EU and other countries in the region having a more lenient approach.

The overall lack of real political will to bring innovative changes to the domestic regulatory system (mentioned above) can also be seen in the inability to prevent the **gold-plating** of EU law that adds an unreasonable regulatory burden in competition with other EU countries and an insufficient ability to push at the EU level for suitable wording of exceptions that would fit into the needs of the V4 region. EU legislation often starts to be criticized just at the time it is already enacted. This is connected with a lack of bottom-up initiative in the region which could be explained by the limited number of home-grown (endogenous) firms and the lack of autonomy of V4 subsidiaries of foreign corporations. It is further aggravated by the underfinancing and understaffing of a real bottom-up civil society, trade unions, consumer organizations and even associations of businesses, that do not have sufficient capacity to follow all procedures at the EU level. Early formulation of national positions is thus almost impossible. Consultations on positions in the V4 format may partly help it improve its chances to influence decision-making at the EU level. However, due to recent developments, there is a risk that legitimate goals that could be represented jointly by V4 countries at the EU level will be overshadowed by the clash with EU institutions over the situation in Poland and Hungary.

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10. Appendix – Questionnaire

A) Initial instructions, consents and identification

By answering this questionnaire you provide consent to use your answers (where relevant with a reference to your specific stakeholder group) for the drafting of a regional comparative study and policy recommendations that will be published and presented to the public.

If you wish so, your full name and affiliation will be mentioned among stakeholders answering the questionnaire, otherwise, only a specific stakeholder group and your country will be put into the list without your name or your exact affiliation.

The questionnaire is divided into specific subsections. Some of the subsections may be more relevant for your field of interest than others. You may skip any question you may not want to answer.

A.1 Do you wish your full name and affiliation to be included in the list of participants?

Yes/No

In the case that you wish so, please provide your name, surname and affiliation: _____.

A.2 Country where you work (underline one):

The Czech Republic

Poland

Hungary

The Slovak Republic

A.3 Dominant Stakeholder Group where you are engaged (underline one or more if relevant):

Scholars, think-tanks or consultancy

Political parties or public administration

Associations of technology industries (IT companies, sharing economy, fintech)

Individual Start-ups (IT companies, sharing economy, fintech)

Chambers of Commerce and associations of employers

Civil Society (labour unions and consumer protection groups)

B) Technology and the V4 region from a global perspective

B.1 What do you think is the most correct statement?

During the period of 2018-2030 new technologies will change our lives **faster** than ever before.

During the period of 2018-2030 new technologies will change our lives but it will be comparable to changes we have witnessed in previous decades.

During the period of 2018-2030 technological progress will be slower and new technologies will change our lives less than in previous decades.

If you need, please provide further explanations:_____.

B.2 In the following table please indicate which regions and individual countries you consider fast/average/slow in adoption of new technologies in relative terms during the period of 2018-2030. Please indicate your expectations by crossing the right column for each line.

Country/Region	Fast adoption	Average	Slow adoption	No opinion
The Czech Republic				
The Slovak Republic				
Hungary				
Poland				
V4 as a whole				
Germany				
The United Kingdom				
France				
EU				
USA				
China				
Russia				
Japan				
India				

B.3 Strengths and weaknesses in your country:

Name existing strengths of your country that may improve adoption of new technologies:

_____
_____

Name existing weaknesses of your country that may make adoption of new technologies more difficult:

_____
_____

B.4 Strengths and weaknesses in the V4 region:

Name existing strengths of the V4 region that may improve adoption of new technologies:

_____

_____

Name existing weaknesses of the V4 region that may make adoption of new technologies more difficult:

_____

_____

B.5 Strengths and weaknesses in the EU:

Name existing strengths of the EU that may improve adoption of new technologies:

_____

_____

Name existing weaknesses of the EU that may make adoption of new technologies more difficult:

_____

_____

B.6 Please indicate if you fully agree (FA) or partially agree (PA) with any of the following statements for the period of 2018-2030?

- Economies of the V4 countries will become less oriented towards the German economy as the German economy will need less industrial supplies from abroad due to development of industry 4.0 and a lower requirement for labour force.
  FA/PA
- The German approach to industry 4.0 will dominate technological transformation in the V4 region.
  FA/PA
- The V4 region has a potential to develop an independent industrial base producing and exporting new technologies.
  FA/PA
- The EU will become a global leader in digitalization outperforming the USA, Japan or China.
  FA/PA
- New technologies will pose a serious threat to social cohesion and the availability of jobs in your country.
  FA/PA
- Your country will outperform other countries of the V4 region in adoption of new technologies.
  FA/PA
- Your country will become a home-country of more successful start-ups than other countries of the V4 region.
  FA/PA
- The sharing economy will significantly change existing socio-economic patterns in your country.
  FA/PA
- At least one start-up (in the area of IT, sharing economy or e-commerce) from your country will grow into a global giant.
  FA/PA
- Fintech start-ups will become an alternative to the existing banking sector.
  FA/PA
- Cryptocurrencies will be prohibited in your country.
  FA/PA
- Your country will become cashless with all payments digitalized.
  FA/PA

- E-government applications will be user friendly and used widely by the whole population.

FA/PA

If you need, please provide further explanations:_____.

B.7 Please indicate the technology (technologies) that have the biggest potential to influence the economy in your country? Please circle one or more or add your own favourite.

Blockchain/Cashless payments/Artificial intelligence/Autonomous cars/Hyperloop/Drones

Or:_____

B.8 The technology and work of your institution, firm

Do you expect that new technologies will change the work and role of your organization in 15 years-time? Please pick the most suitable from the following:

The current role will become obsolete / Significant changes are expected / Only minor changes are expected / The work and role will remain mostly the same

C) Best practices and what can be done better?

Please name the biggest obstacles for adoption of new technologies in your country:

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Please name what structural changes should be made to overcome these obstacles:

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How should the state help with adoption of new technologies and development of the knowledge economy?

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What would you consider as best practices (state programmes, business solutions) in your country that could also be adopted in other countries of the V4 region?

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D) Sector specific questions (please provide answers to questions which you find interesting or the most relevant)

This part is fully optional and can be freely adjusted based on the background of the interviewee.

D,1 Finances and Technology

What can V4 countries expect from the fintech revolution? How will the fintech revolution transform the banking and finance sector in V4 countries? Would the traditional players in the V4 banking sector dominate also in the world of new financial technologies? When, if ever, can we expect the cashless economy in V4 countries? In V4, only Slovaks have the euro, can we expect that fintech will help to overcome currency exchange costs in cross-border? Why should it be more difficult to pay taxes and charges than for goods in e-shops? When will our state authorities be ready to accept online payments with no restrictions? Can we ever have online payment by default as a principle for all state services?

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D.2 Technology and Internet

What are the specific ways that people in V4 countries use the internet? Is EU legislation targeting the issues that are of concern? Is there any issue which is less relevant or more relevant for V4 or your country than in the rest of the EU? How are Internet users from V4 countries specific? Are we more careful and suspicious? What can be improved in the user friendliness of services provided by state and other public authorities? Is the digital by default principle observed in your country? What are the most painful broadband internet blind spots in your country?

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D.3 Technology and Industry

How will industry 4.0 transform the economies of V4 countries? Will it change your country's position in industry chains in the internal market, and towards Germany as the main trading partner? Are V4 countries expected to be winners or losers from industry 4.0? What sectors are endangered in particular? Are the V4 countries ready and what can be improved? Do the V4 countries have enough skills and are they flexible enough to find new roles for labour under industry 4.0? How can state policy help and is there space for coordination between V4 countries?

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D.4 Start-ups environment

How can the economic and regulatory environment be shaped to allow start-up industry and e-commerce to grow in our region? What can be done to simplify cross-border operation of start-ups in V4 region? Is there space for coordination of policies and what should be done? How can networking and cooperation of start-ups from within our region be supported? Is it possible to develop V4 coordinated promotion of start-ups abroad, e.g. in the USA, UK or elsewhere, such as a V4 start-up fair or V4 start-up hub e.g. in California or in London?

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D.5 Technology and transportation

How will changes in the means of transportation influence our economy and the place of the V4 region on the global map? Is our region prepared for the expected transformation of the automotive industry into a service providing modern mobility? Can our regional solutions withstand global competition in the domestic market or even expand? Is the hyperloop and any other futuristic means of transportation relevant for our region? Can we expand with transportation services (e.g. bus, railway) outside the V4 region to other EU states? Do you consider it possible to employ new technologies and achieve connectivity to the capital city from anywhere in your country within one hour?

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Association for International Affairs (AMO)

AMO is a non-governmental not-for-profit organization founded in 1997 in Prague to promote research and education in the field of international relations. This leading Czech foreign policy think-tank owes no allegiance to any political party or to any ideology. It aims to encourage pro-active approach to foreign policy issues; provide impartial analysis of international affairs; and facilitate an open space for informed discussion.

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The main objective of the project is to start a broad expert discussion on what are the best ways forward for V4 countries with the ongoing digital revolution. For this purpose the project will provide a publication gathering knowledge from the most relevant stakeholders in the V4 region for the digital agenda and suggest policy recommendations reflecting regional specificities thus starting a debate already during the interviews.