NATIONAL DIGITALISATION STRATEGY

2022-2030

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Prepared by: Cabinet Office of the Prime Minister

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Executive summary

The rationale and background of the NDS

1. **Digitalisation is undoubtedly one of the dominant phenomena of the 20th and 21st centuries**, and it is fundamentally changing the functioning of a country's economy and the everyday lives of its citizens. It has been clearly illustrated by the COVID-19 epidemic that also in the short term, only those countries and societies will be able to compete on international markets that embrace and consciously apply digital technologies in all aspects of life.

2. Hungary **has undergone significant economic and social development since 2010**, and digitalisation is no exception:

   - The roll-out of superfast internet has now been completed in nearly the entirety of the country, meaning that 96.7% of households[1] can now have access to the most advanced network connectivity, whether wired or wireless (including mobile), if they so wish. As far as public networks are concerned, responsible organisations provide a world-class quality of service.

   - High-speed internet connectivity in schools has increased significantly: more than 90% of institutions have a 100 Mbps network connection, covering more than 1 million primary and secondary school students[2], with a WiFi coverage of 99%.

   - International comparators rank Hungary 43rd in terms of global mobile network performance. [3] In March 2022 the peak download speed of 5G networks exceeded 652 Mbps, which puts Hungary in 14th place in the world. [4] These figures show that Hungary has a very high quality mobile network capable of meeting user needs.

   - The proportion of people who use the internet on a daily basis has increased significantly, while the number of people who do not use the internet at all has fallen to one third. The fact that more and more of the elderly and disadvantaged citizens are getting involved in the digital world is great news.

   - Encouraged by support programmes and measures implemented by governments, businesses are increasingly relying on state-of-the-art digital solutions that can help them boost their competitiveness and overcome the crisis caused by the coronavirus.

   - The extremely fragmented, uncoordinated and wasteful IT developments of public administrations that existed before 2010 are now reorganised with a unified and firm public engagement, and many public services for citizens and businesses are now also available electronically, with higher quality standards.

3. The digital ecosystem in Hungary, despite the progress made, still poses challenges for government decision-makers. The **National Digitalisation Strategy (hereinafter**

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[1] Source: https://digital-agenda-data.eu/datasets/desi/visualizations
[2] In the academic year 2020/2021, 1.2 million learners were enrolled in primary and secondary schools.
[3] Source: https://www.speedtest.net/global-index
[4] Source: https://www.opensignal.com/2022/06/22/benchmarking-the-global-5g-experience-june-2022

referred to as: NDS), therefore seeks to contribute to Hungary's efforts to **put digital infrastructure, economy, education and digital public services at the centre of its competitiveness and modernisation efforts**, recognising the need for digital transformation.

4. **The Strategy is particularly relevant** in view of on the one hand the completion of the National Infocommunications Strategy in 2020, and on the other hand the fact that the investment priority
"Smarter Europe" of the five central priorities of the European Union's regional and cohesion policy for the period 2021-2027 explicitly highlights the importance of digitalisation - putting it on the same level as innovation and the development of small and medium-sized enterprises. The main EU document in the field of digitalisation between now and 2030 is the policy programme **Digital Compass (Roadmap to the Digital Decade)**[5], setting out the directions for the digital transformation of businesses, the digitalisation of public services, secure and sustainable digital infrastructures and the development of digital skills. These objectives are also reflected in the pillar structure of the National Digitalisation Strategy.

5. As a framework strategy, the NDS will **structure, consolidate, update and, where necessary, supplement** the current situation assessments, visions and tools of the government documents prepared so far within the framework of digitalisation.

The importance of the NDS

6. **Digitalisation (in a more restricted sense, the ICT sector) plays a prominent role in creating value and boosting competitiveness worldwide**. The Gross Value Added (GVA) generated directly and indirectly by the ICT sector **already accounts for more than 20% of the total Hungarian GVA**; the rate of the dynamic internal digitalisation in other sectors (e.g. automotive, machinery, financial and insurance services, etc.) cannot be measured using traditional statistical methods, but it can be concluded that the digital economy is increasingly being contributed to also by non-ICT sectors. **The proportion of people employed in the digital economy, adjusted for multiplier effects, already reaches 17% of total employment;** this figure does not include people working in digital positions in other sectors and the multiplier effect linked to their employment. The **ICT sector is the second largest exporter of the national economy** (after automotive), accounting for 8.7% of total exports in 2019, being a performance similar to that of agriculture and food production combined[6].

7. The **crisis caused by the coronavirus** and the response the government and economic actors gave to it clearly demonstrate that digital technologies, the use of services available remotely on the internet, teleworking can no longer be ignored in nearly the entirety of white-collar jobs, and that blue-collar workers are also affected by this labour market phenomenon. ICT skills are now one of the most important competences in the workplace, a fact further reinforced by the pandemic situation.

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[5] https://digital-strategy.ec.europa.eu/en/library/proposal-decision-establishing-2030-policy-programme-path-digital-decade

[6] Source: IVSZ (Microsoft Hungary): The weight of the digital economy in the Hungarian economy, 2019

The pillar structure of the NDS

8. This strategy follows the pillar structure defined by the National Infocommunications Strategy as follows:

- PILLAR I: **Digital infrastructure**;
- PILLAR II: **Digital competence**;
- PILLAR III: **Digital economy**;
- PILLAR IV: **Digital state**.

Methodology

9. This strategy **follows international standards for government strategy making**, both as regards the process of strategy development and the structure and content of the document.

Situation analysis

10. **According to the DESI 2022 Country Report, Hungary ranks 22nd all aspects considered.** When looking at the combined results, the pace of growth in Hungary is similar to that in the EU. During the last 5 years, Hungary has made the most significant progress in the areas of internet access (75% increase over 2016) and the integration of digital technologies in businesses (60.8% increase over 2016), while there is virtually no change in the human capital dimension and a smaller, albeit noticeable, increase in digital public services, or more specifically when comparing it with other countries.

Figure 1: Ranking of EU Member States based on the DESI 2022 report
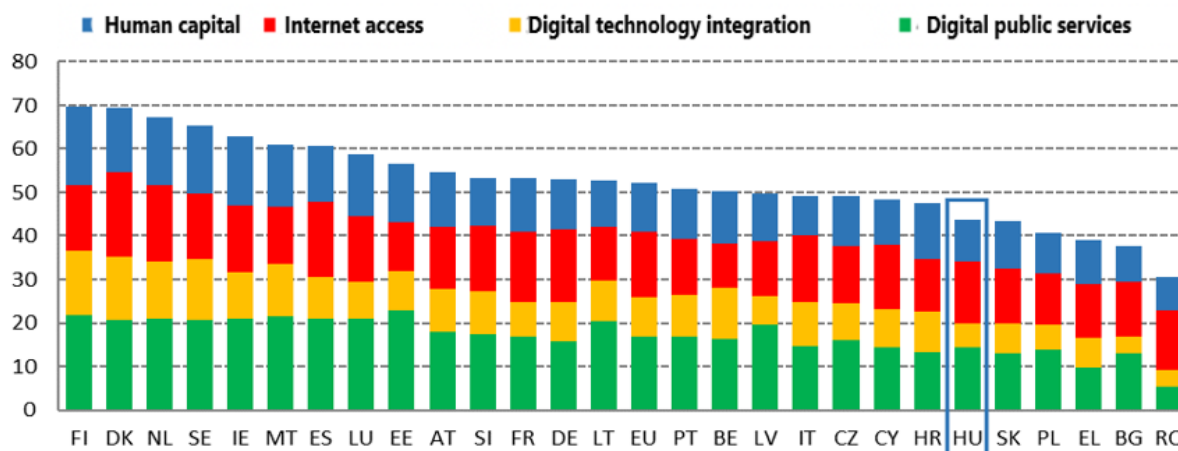
Source: Digital Agenda Scoreboard http://digital-agenda-data.eu

11. In terms of **internet access** (connectivity), Hungary has seen a significant increase from 2016 to 2022, and is currently ranked 13th in this dimension.

Figure 2: Hungarian and EU average data for the DESI Internet connectivity dimension, from 2016 to 2022
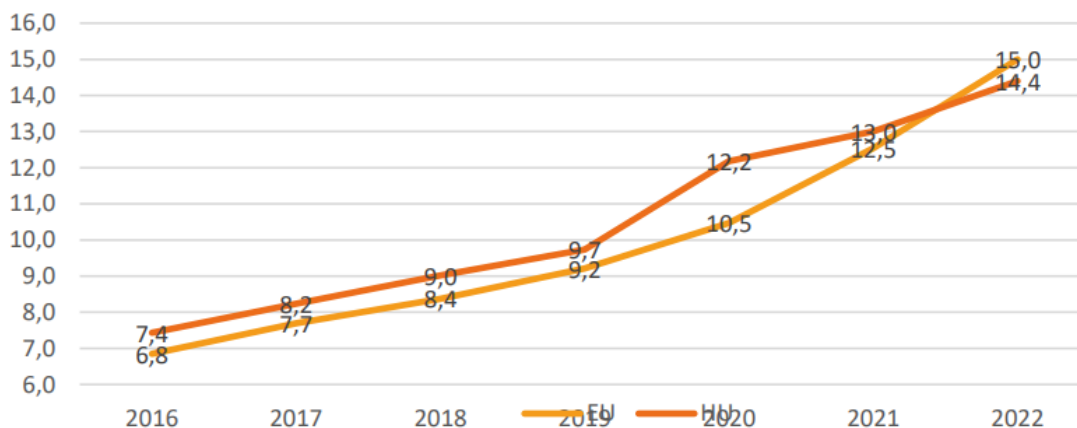
12.   In terms of **human capital**, Hungary ranks 23rd among EU countries in the 2022 report. Hungarian data regarding this dimension have been below the EU average every year since 2016, with the exception of only one indicator (ICT graduates), there is no other area where Hungary is not lagging behind.

Figure 3: DESI human capital dimension data, Hungarian and EU average, from 2016 to 2022
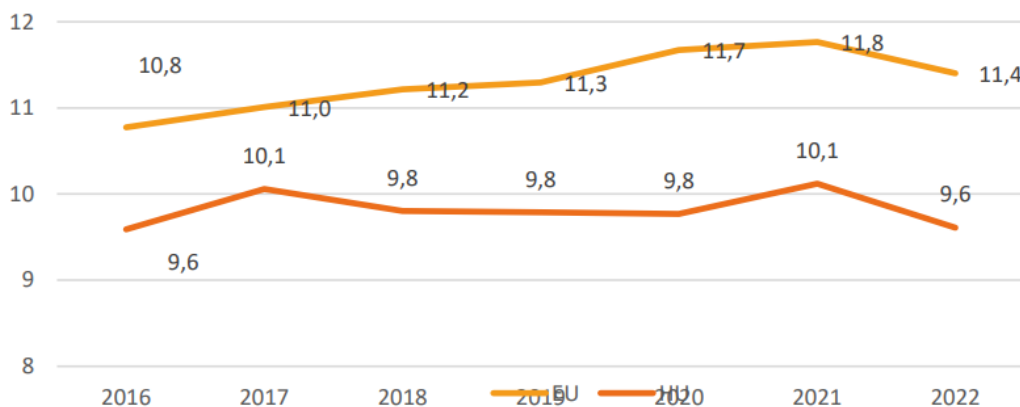
13.   In terms of **Integration of digital (business) technologies**, Hungary ranks 25th overall in the competition of EU Member States. For the time being, Hungary shows the worst performance in the business (especially SME) segment, with only its cross-border online sales and e-commerce revenues being close to the EU average. E-commerce is the area where the most significant improvements are expected to be seen, as the use of ICT services (as well as e-commerce itself) leads to cost savings for households and businesses, and more and more of them will opt for e-commerce solutions.

Figure 4: Average data for Hungary and the EU concerning the DESI digital technology integration dimension, from 2016 to 2022

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
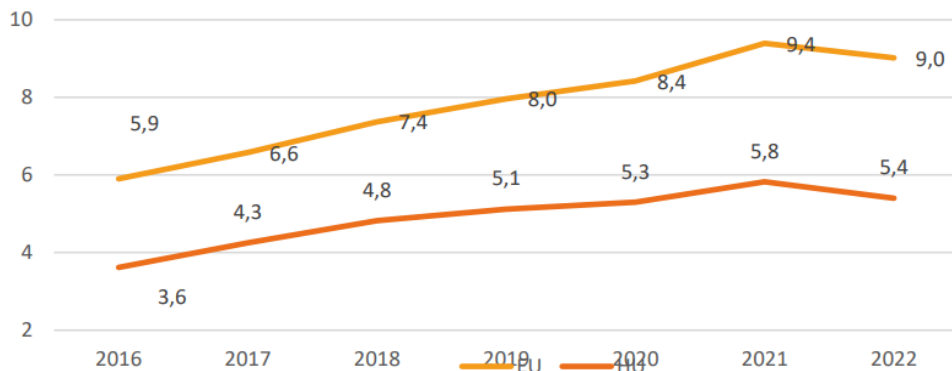
14.   In the area of **digital public services**, Hungary has improved four places from its previous ranking in 2021 (from 24th to 21st), clearly showing that in recent years Hungary has been growing faster than the EU average in this area. Compared to 2016, the Hungarian aggregate cumulative figures in this dimension improved by over 50%, but this increase meant only a slight narrowing of the gap vis-à-vis the EU average.
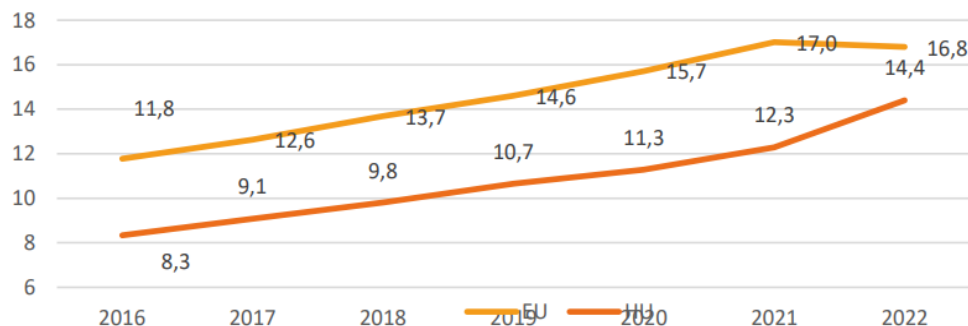
Figure 5: Hungarian and EU average data for the DESI digital public services dimension, from 2016 to 2022

Source: https://digital-agenda-data.eu/datasets/desi/visualizations

15.   Recognising the need for digital transformation, the NDS vision places **modern, high-speed broadband infrastructure, the digital economy, digital skills development and digital public services** at the heart of Hungary's competitiveness and modernisation efforts, with the aim of moving Hungary from the 22nd place to the European **top ten** Recognising the need for digital transformation, the NDS vision places modern, high-speed broadband infrastructure, the digital economy, digital skills development and digital public services at the heart of Hungary's competitiveness and modernisation efforts, with the aim of moving Hungary from 22nd place in the European **top ten** in terms of digital economic and social development **by 2030**. Thanks to this progress, digitalisation can be a **breakthrough** for the Hungarian economy and society also at an international level.

16.   A major prerequisite for the realisation of this vision is the **long-term and consistent representation of the Government's commitment to digitalisation** in government communication, operations, resource allocation, economy, research and education.

Objectives

17.   The **overall objective of the NDS** is to ensure that Hungary identifies and leverages the potential of digitalisation in the fields of economy, education, research, development and innovation, as well as public administration, thus contributing significantly to the country's competitiveness and the well-being of its citizens.

18.   The fulfilment of the overall objective of the NDS **in the case of each pillar is supported by the following pillar-specific objectives**.

	OBJECTIVE
Digital infrastructure	Availability of wired and wireless digital infrastructure of sufficient capacity and quality of service so that the digital ecosystem will not suffer from bottlenecks due to the lack of high-capacity infrastructure.
Digital competence	Increase the proportion of digitally literate employees and the number of IT professionals (especially women) and reduce the number of people who are digitally left behind, by continuously improving the digital competence and user awareness of the population and the digital skills of workers.
Digital economy	Increase the digital readiness of businesses, digital technology integration, stimulate the development and diffusion of innovative digital solutions in all sectors, and improve the performance of Hungarian SMEs active in the ICT sector, in particular start-ups, in line with the priorities outlined in the Smart Specialisation Strategy 2021-2027 (S3). A priority is to support the data economy, in line with Hungary's Artificial Intelligence Strategy.
Digital State	Broadening the range of available customer-friendly digital public services and improving the openness and motivation of citizens and businesses to use these services, enabling cross-border service delivery in the areas required by the EU, and increasing the efficiency of front-office and back-office processes by automating and building the interoperable data networks needed for data and cloud-based operation.

Indicators

DIGITAL INFRASTRUCTURE

Indicator	Baseline value (year)	Target value (year)
DESI Internet access indicator (subindex) annual value	**57.6 (2022)**	**70 (2030)**
Percentage of households covered by a Gigabit-capable network	79% (2022)	95% (2030)
5G coverage	18% (2021)	67% (2025)
Availability of National Telecommunications Backbone Network (NTG) endpoints in district seats	50% (2020)	75% (2025)
Percentage of public education and vocational training institutions connected to a network with a bandwidth of at least 1 Gbps	9.08% (2021)	100% (2030)
National supercomputing (HPC) capacity	0,45 Pflops (2020)	15 Pflops (2030)

DIGITAL COMPETENCE

Indicator	Baseline value (year)	Target value (year)
DESI Human capital indicator (subindex) annual value	**38.4 (2022)**	**55 (2030)**
Percentage of people without digital skills (proportion of people aged 16-74 not using the internet)	9.93% (2021)	5% (2030)
Proportion of regular internet users in the age group 16-74	82.3% (2021)	95% (2030)
Percentage of BSc graduates in higher education in computer science	4.9% (2020)	10% (2030)

DIGITAL ECONOMY

Indicator	Baseline value (year)	Target value (year)
DESI Integration of digital technologies in businesses annual value of indicator (subindex)	**21.6 (2022)**	**45 (2030)**
Percentage of enterprises with integrated (digitalised) business processes (with ERP)	20.9% (2021)	32% (2030)
Percentage of enterprises using Big Data analytics	7% (2020)	15% (2030)
Percentage of enterprises selling online	15.9% (2021)	25% (2030)
R&D expenditure in the "Information and communication" sector as a percentage of total domestic expenditure on R&D	8.7% (2019)	11% (2030)

DIGITAL STATE

Indicator	Baseline value (year)	Target value (year)
DESI Digital public services indicator (subindex) annual value	**57.4 (2022)**	**75 (2030)**
Users of e-Government services	81.5% (2021)	90% (2030)
Automatic completion of forms (0-100 points[7])	59,7 points (2021)	90 points (2030)
Digital public services for citizens (0-100 point)	64,4 points (2021)	95 points (2030)
Digital public services for businesses (0-100 points)	73,8 points (2021)	95 points (2030)
Percentage of provision of electronic public administration services and the necessary data for digital citizenship through the national cloud infrastructure[8]	-	67% (2030)
Open data	58% (2021)	90% (2030)

Tools

Groups of actions of the pillar "Digital infrastructure"

DI I. Developing Gigabit-capable networks
DI II. Digital infrastructure development for public education, higher education, vocational and adult education, research network and public collection institutions
DI III. Further development of the National Telecommunications Backbone Network by increasing bandwidth, by covering public institutional points not yet covered
DI IV. Further development of wireless communications for Public Protection and Disaster Relief (PPDR)
DI V. Expanding the supercomputing (HPC) capacity serving SMEs, research networks and public institutions
DI VI. Encouraging the development of new generation mobile networks

Groups of actions of the pillar "Digital competence"

DK I. Launch of digital competence development programmes for the public based on DigKomp
DK II. Increasing the availability of IT professionals and digitally literate employees
DK III. Strengthening digital competence development in public education, vocational training and higher education

Groups of actions of the pillar "Digital economy"

DG I. Dedicated programmes to address areas where the integration of digital technologies both inside and outside the enterprises is lagging behind
DG II. Targeted and innovative development of the ICT sector and ecosystem
DG III. Use of public data assets for economic purposes

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[7] Value normalised using DESI methodology, and based on eGovernment Benchmark results as data sources.
[8] Not a DESI methodology indicator, but a national indicator.

Groups of actions of the pillar "Digital state"

DÁ I. Coordinated and user-friendly digital development of central and regional administrations and specialised systems
DÁ II. Creating a data-based state/public administration
DÁ III. Developing smart communities and regions, supporting the development and operation of local digital public services
DÁ IV. Improving the information security of public electronic services
DÁ V. Digital development of public services, with a particular focus on the further development of e-health solutions

19.   Successful implementation of the Strategy requires an **institutional system** the members of which are committed to the objectives and instruments identified on the basis of the situation analysis, and are working closely together and supporting each other. The primary task of the **monitoring system** is to examine the implementation/fulfilment of the objectives set out in the situation analysis chapters of the Strategy, thus enabling public intervention in areas where the achievement of the objectives set is not progressing according to the schedule set out in the Strategy or where there are developments that run in the opposite direction compared to the original objectives. The main tools of the monitoring system:

- Detailed indicator system
- Information portal
- Interdepartmental Committee/Working Group
- Regular reporting to the Government
- Preparing interim evaluations

20.   The **indicator system** of the NDS defines the focus areas of the indicator system taking into account on the one hand the pillars of the Strategy and on the other hand the DESI index measurement system. They also largely correspond to the structure set out in the fundamental documents of long-term EU planning.

1. Introduction

1.1. *Motive and mandate: purpose and background of the strategy*

Digitalisation is undoubtedly one of the dominant phenomena of the 20th and 21st centuries, and it is fundamentally changing the functioning of a country's economy and the everyday lives of its citizens. It has been clearly illustrated also by the COVID-19 epidemic that also in the short term, only those countries and societies will be able to compete on internationally that embrace and consciously apply digital technologies in all aspects of life.

The majority of economic analyses identify the use of advanced digital technologies as the most important breakthrough point in the life of a national economy. Naturally, this effect can only materialise if national governments are committed to digitalisation, fully implement the investments needed to address the gaps and backlogs in the digital ecosystem and create a supportive regulatory environment.

Hungary has made significant progress since 2010, and digitalisation is no exception to that. Superfast internet has been rolled out across almost the entire country, increasing the proportion of households with access to broadband infrastructure from 50% to 96.7%, meaning that the vast majority of households in Hungary now have access to state-of-the-art network connectivity. The proportion of households actually using the internet has increased from 50% in 2010 to over 83% in 2021 (in line with international trends). This has helped to significantly increase the proportion of people who use the internet on a daily basis (largely due to the uptake of smart phones and the spread of mobile internet), while the proportion of people who are not connected (33.1% in 2010) has fallen to one third (also owing to targeted government programmes) and is now below 10%.[9] The number of businesses that rely more and more on state-of-the-art digital solutions, both internally and externally, has continued to grow, and the previously fragmented, uncoordinated and wasteful public IT developments have been reorganised under a unified and strong public engagement.

Nevertheless, Hungary cannot stop at this point, further developments are necessary to be able to keep up with the global competition also in the future.

The National Digitalisation Strategy (NDS) seeks to contribute to Hungary's efforts to put the digital economy, education and digital public services at the centre of its competitiveness and modernisation efforts, recognising the need for digital transformation. The construction of a truly 21st century Hungary is unthinkable without the deployment and use of advanced digital solutions throughout the entire economy and society. This requires

- the availability of modern, future-proof and high-capacity broadband networks,
- prepared users with a high level of digital literacy,

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[9] See the chapter Situation Analysis.

- economic actors to recognise the potential of digitalisation to boost competitiveness,

- digital technologies being used at all levels of public administration.

The definition of the strategic mandate is based on the Government Decree on the responsibilities and powers of the members of the Government. Previously, the Minister of Innovation and Technology was responsible for audiovisual policy, electronic communications and information technology, while the Minister of the Interior was responsible for e-administration and for ensuring the feasibility of public administration IT infrastructure, and the Head of the Prime Minister's Office was responsible for the unification of e-administration and IT developments. As from May 2022, pursuant to Article 9 (1) of Government Decree 182/2022 (V. 24.), all these responsibilities shall fall under the competence of the Minister heading the Cabinet Office of the Prime Minister. The National Digitalisation Strategy was prepared by the relevant ministries working in close coordination.

The Strategy is particularly relevant in view of on the one hand the completion of the National Infocommunications Strategy in 2020, and on the other hand the fact that the investment priority "Smarter Europe" of the five central priorities of the European Union's regional and cohesion policy for the period 2021-2027 explicitly highlights the importance of digitalisation - putting it on the same level as innovation and the development of small and medium-sized enterprises. The main EU document in the field of digitalisation between now and 2030 is the policy programme **Digital Compass** (Roadmap to the Digital Decade)[10], setting out the directions for the digital transformation of businesses, the digitalisation of public services, secure and sustainable digital infrastructures and the development of digital skills. These objectives are also reflected in the pillar structure of the National Digitalisation Strategy.

The NDS, through its design, content, objectives and actions, is a strategy that meets the eligibility criteria and the criteria for mobilising the European Regional Development Fund for the EU budget period 2021-2027, as defined in the following Community Guidelines:

- PO1: Smart Specialisation Strategy (S3, in part)

- PO3: National or Regional Broadband Development Plan

The planned objectives and actions of the NDS are in line with the digitalisation elements of the national plan of Recovery and Resilience Facility (RRF), and partly the background strategy of the latter.

Given the above, an important task of this Strategy, in conjunction with the EU development policy cycle 2021-2027, is to

- Provide an integrated framework for the initiatives, strategies, development directions and vision within the digital ecosystem;

- set out the objectives in this area;

- outline public policy, regulatory and support actions to be taken;

- take stock of the resources required for the implementation of the above.

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[10] https://digital-strategy.ec.europa.eu/en/library/proposal-decision-establishing-2030-policy-programme-path-digital-decade

1.2. Interpretation and demarcation

1.2.1. Interpretation

For the purposes of this Strategy, a digital ecosystem is a system in which users (citizens, businesses, public/governmental institutions, academic and scientific communities, civil society organisations) and devices communicate with each other on digital platforms, using tens of thousands of content sources and applications, using wired and wireless (5G, later 6G mobile technology) broadband networks that provide gigabit data traffic.

The term was coined in recognition of the fact that the development of a (sectoral) area can only be truly effective if the strategic objectives and their implementation affect all components of the ecosystem simultaneously, as this will ensure that the balance between the level of development of the individual elements is not disrupted. An essential property of an ecosystem is that each of its elements is dependent on the others, so if any element is favoured over another, it will lead to instability or disruption of the system.

1.2.2. Demarcation

Apart from the National Infocommunications Strategy (NIS) 2014-2020 and the Digital Success Programme 2.0 (hereafter: DJP 2.0), a number of government policy documents (strategy, concept, action plan, analysis) have been prepared in previous years that set out strategic goals and measures for a specific segment of the digital ecosystem.

At the same time, the complexity of the digital ecosystem and the interdependence of its elements justify the need for a government strategy covering the entire digital ecosystem, all its dimensions (digital infrastructure, digital competence, digital economy, digital state) and horizontal aspects (e.g. information security, digital R&D&I, child protection, etc.), reflecting the challenges to be faced during the period 2022-2030.

The NDS is the government's digitalisation strategy document, which, based on a comprehensive assessment of the situation, identifies the obstacles to the spread of digitalisation, identified as a cornerstone of competitiveness, and then assigns an appropriate set of instruments to achieve its clearly defined goals.

In this sense, the NDS is an umbrella strategy that groups, refines and sometimes supplements the measures contained in the various strategic documents - directly linked to the digital ecosystem or defining the tasks of a policy area, but also including a digital element - according to its own pillar structure, filtering through the digitalisation criteria.

When compiling the set of instruments for the strategy, we primarily reviewed, combined or extended the relevant strategies already prepared (adopted, submitted or identified in the work phase), and in several cases we proposed new measures based on the situation analysis and SWOT findings. When compiling the set of instruments, particular attention was paid to the fact that digitalisation can

play an important role also in mitigating the economic and social consequences of the COVID-19 epidemic

The NDS is primarily based on NIS and DJP 2.0, however, in its set of instruments

- it displays a high proportion of strategic documents with a specifically digital focus and content (e.g. Artificial Intelligence Strategy, 5G and Gigabit Hungary working papers, etc.);
- strategies that contain digital elements but have a different policy focus are presented only in terms of their digital content, if necessary expanded and complemented by the digitalisation objectives and measures contained in them (e.g. SME strategy, RDI strategy);
- strategies that only tangentially address digitalisation are only included if relevant digitalisation objectives or measures have been identified as gaps during processing and reflected in their own set of objectives and instruments.

Another important aspect is that in the case of strategies already enacted by the government, in order to avoid duplication, the NDS takes into account measures that have been implemented or are being implemented.

1.3. Importance of the ICT sector for the economy and the society

1.3.1. Economic importance

Digitalisation plays a key role in creating value and boosting competitiveness. In its survey entitled "The weight of the digital economy in the Hungarian national economy "[11], IVSZ developed a method that, in addition to the traditional (ICT sector) method, also takes into account the multiplier effect on the input side (indirect effect through the suppliers of the ICT sector and induced effect through the consumption and domestic spending of ICT employees) and the multiplier effect on the output side (investment and user effect on the customers of the ICT sector) in order to accurately determine the weight of the digital economy in the national economy.

**1.3.1.1 Contribution to gross value added (GVA)**

In the survey, they first applied the traditional method used previously to measure the weight of the ICT sector in order to calculate the direct and indirect contribution of ICT activities and services to the national economy. [12]

Based on the data collected using the new methodology (taking into account the ICT sector directly, as well as its indirect and induced impacts), the following findings can be made:

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[11] Source: IVSZ (Microsoft Hungary): Study on the weight of the digital economy in the Hungarian economy, November 2019, https://ivsz.hu/a-digitalis-gazdasag-sulya-2019/

[12] The economic weight of a traditional industry can be measured primarily through gross value added (GVA), which is the surplus of the direct material costs of goods and services produced and sold (domestically and abroad) over the direct material costs of those produced and sold products and services during a given period.

Figure 6: Contribution of the ICT sector to GVA calculated using the new methodology
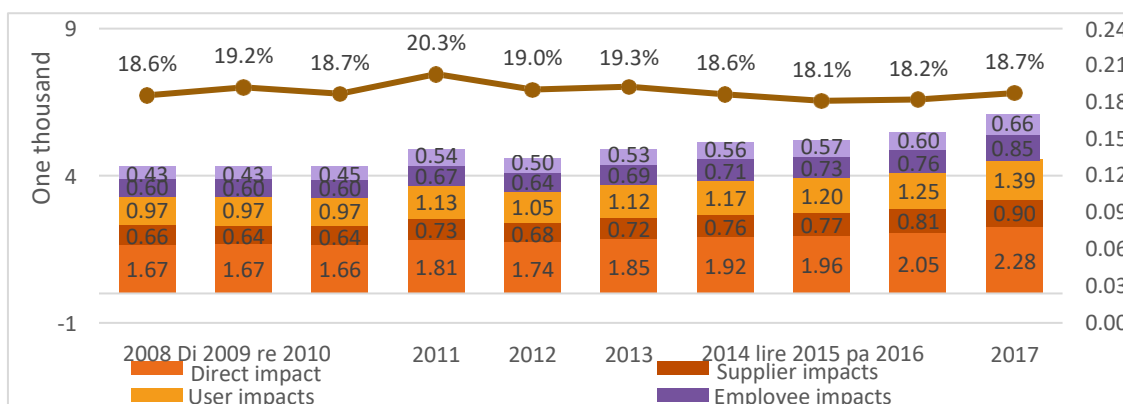

Source: IVSZ (Microsoft Hungary): The weight of the digital economy in the Hungarian economy, 2019

- Over the past 5 years, the gross value added (GVA) generated directly and indirectly by the ICT sector has increased by more than 20% to HUF 6 thousand billion, which means that the sector accounts for around 20% of total Hungarian GVA, including any multiplier effects;

- Experts estimate that the digital economy, which is increasingly expanding beyond the ICT sector measurable using statistical methods, already accounts for at least 25% of total GDP, if we take into account the ever-expanding in-house digital developments by non-ICT firms (e.g. car manufacturers, manufacturing plants, financial services, e-commerce, IT consultants, SSCs, etc.);

- The digital economy can therefore become the engine of the entire national economy: the rapid introduction of new technologies (5G, IoT, AI, blockchain, cloud, etc.) would, according to the model calculations, result in an annual GDP growth of almost as much as HUF 4 thousand billion by 2023, which is almost 10% of the current Hungarian GDP.

- The ICT sector - taking also into account multiplier effects - provides employment for 17% of the workforce already today; the share of people employed in the digital economy - considering also those employed in digital jobs in other sectors - might be even higher, exceeding 20%.

With the changes in the economy over the past few years, it is clear that the digital economy is much broader than the ICT sector itself, and the picture painted of the sector includes only part of the digital economy, as it does not include the growing digital development activities of non-ICT firms (e.g. car manufacturers, manufacturing plants, financial services, e-commerce, IT consultants). According to estimates by the ITS, taking these factors into account (and applying the input-output indicator to them), the contribution of the digital economy to domestic GDP may exceed 25% in the near future.

The economic impacts of digital infrastructure, the link between GDP per capita and the uptake of fixed broadband, have been analysed by the OECD in its long-standing analysis (see Figure 7). According to the latest available data (2021), there is still a significant correlation between the two variables (correlation value of 0.54), i.e. the higher the broadband penetration in a country, the higher the GDP per capita, but the correlation is also true in reverse, the higher the economic development of a country, the higher the internet uptake.

Figure 7: Correlation between OECD fixed line broadband penetration and GDP per capita, 2019[13]
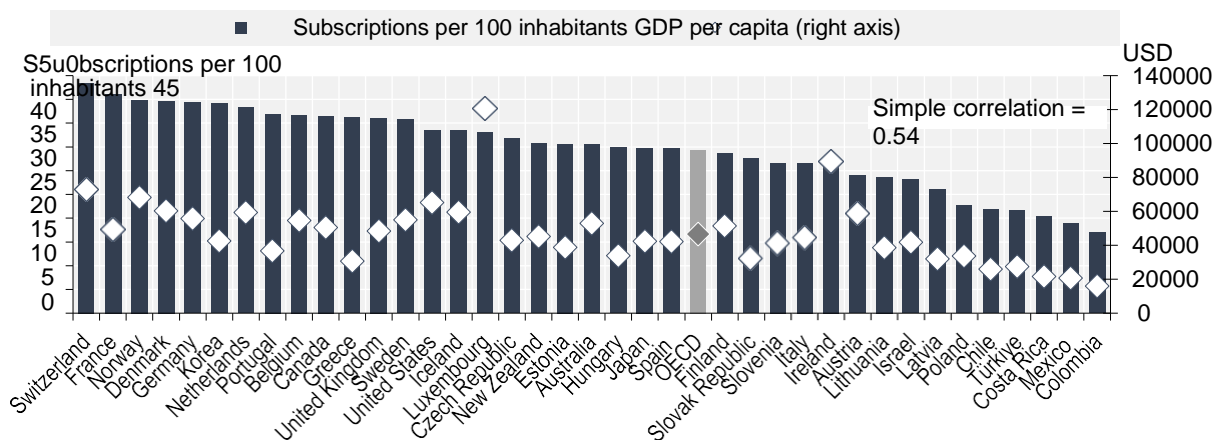

Source: OECD broadband portal, 2021

1.3.1.2 Employment impact

Using the traditional methodology, the digital sector directly employed 199,000 people in Hungary in 2018, accounting for 3.7% of the total number of people working in the national economy, or one in twenty-seven people. The sector offers above average earning potential for employees in the ICT sector in Hungary.

Calculated using the new methodology, the digital economy has contributed to the creation or preservation of an average of 547-660 thousand jobs in recent years. This means that the digital economy as a whole provided employment in some form for 14-17% of Hungarian employees.

Figure 8: Employment impact of the ICT sector calculated using a multiplier
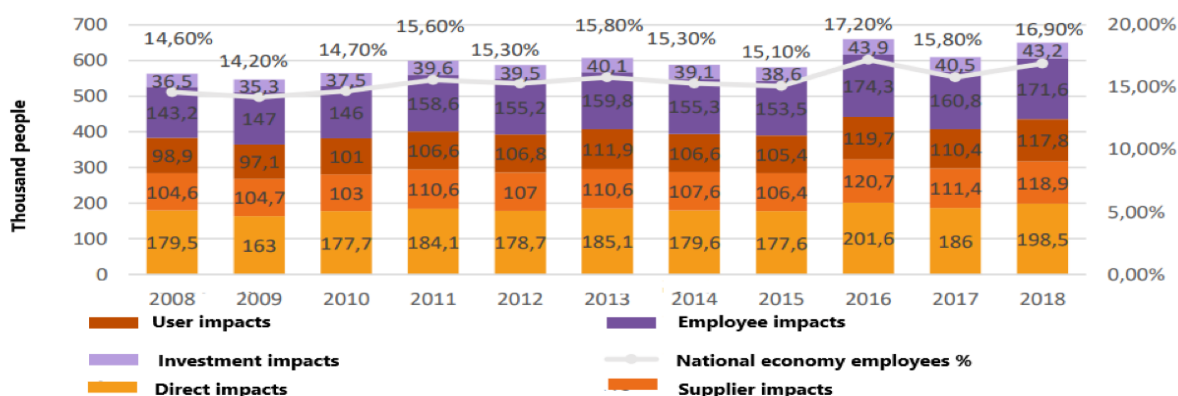
Source: IVSZ (Microsoft Hungary): The weight of the digital economy in the Hungarian national economy, November 2019, https://ivsz.hu/a-digitalis-gazdasag-sulya-2019

As in the case of the GVA, the employment rate of 14-17% calculated with the new methodology does not fully include the employees in digital jobs in other sectors and the multiplier effect associated with their employment. According to estimates by IVSZ, in addition to those employed in the ICT sector,

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[13] Data processing was finalised in December 2021.

the overall digital economy, which also covers digital jobs in other sectors, now provides employment for at least 20% of the workforce at the national economy level. This is supported by the fact that, according to Eurostat data, the share of Hungarian companies with more than 10 employees that have difficulties in filling digital jobs increased from 3% in 2012 to 7% in 2018.

1.3.1.3 Export, investment, R&D&I

The ICT development sector is the second largest exporter in the national economy, second only to the automotive sector: its exports, worth HUF 2,657 billion, accounted for 8.7% of total merchandise exports in 2019, a performance comparable to that of the Hungarian agriculture and food economy combined. The ICT services sector can also be considered a major player in the foreign trade of services of Hungary, as the sector accounted for around 9% of services exports in 2019.

The ICT sector plays an important role also in the area of investments: between 2008 and 2018, the ICT services sector invested more than HUF 2,000 billion in total, accounting for 3.5% of the national economy's investments on average.

Of the total ICT sector (excluding hardware manufacturing), the Information and Communication branch accounted for 8.1% of Hungarian R&D expenditure in 2018, according to the Central Statistical Office (KSH). The ICT development sector (hardware manufacturing and software development) has a smaller weight in the national economy, while ICT services have a larger weight than their share in Hungarian gross value added. The R&D activity of the entire ICT sector followed a downward trend as a share of total ICT spending in the economy until 2014-2016, but in the following years the increasing share of ICT services is expected to offset the declining contribution of the ICT development sector. There are several areas where the players of the Hungarian ICT sector, their products and services are competitive also on a global scale.

1.3.1.4 Forecast - New Technology-Driven Pathway

The added performance expected from new technologies (e.g. 5G, IoT, AI, blockchain) has been quantified by the IVSZ study in a so-called "New Technology-Driven Pathway" scenario. If the government promotes the implementation of a technology-driven growth path and the necessary investments are made to allow the uptake of these technologies, the weight of the sector in GVA could be nearly 8 percentage points higher than in the case of an organic (no technology breakthrough) path by the end of the forecast horizon, and may exceed 25%.

Figure 9: Technology-led growth path
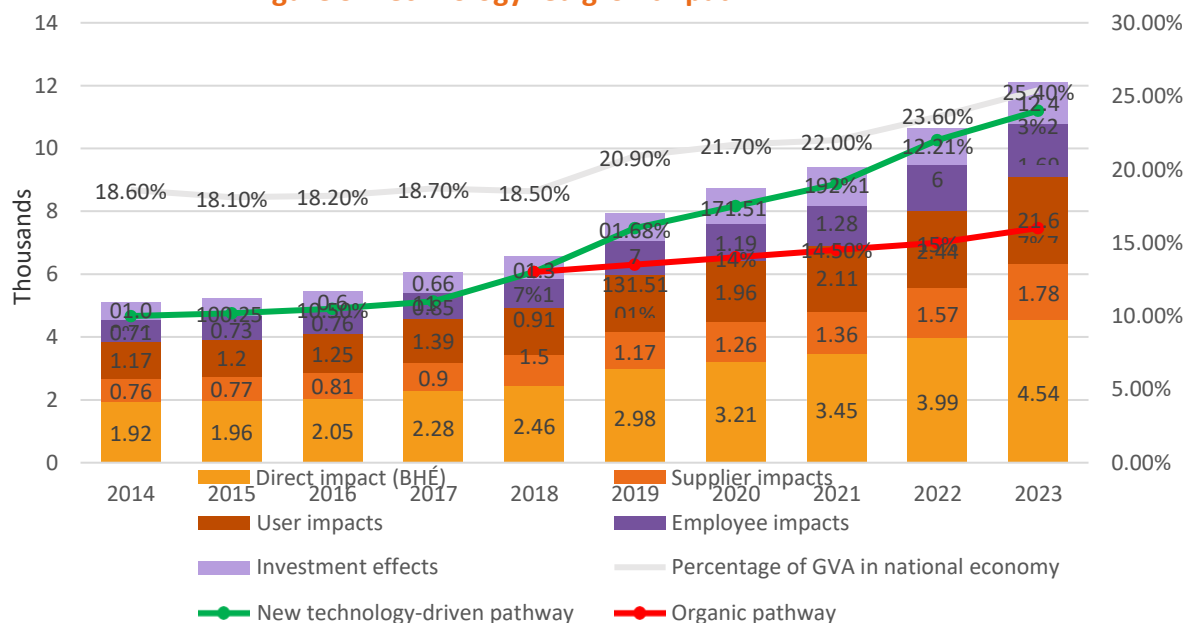
Source: IVSZ (Microsoft Hungary): The weight of the digital economy in the Hungarian national economy, November 2019, https://ivsz.hu/a-digitalis-gazdasag-sulya-2019

In the technology-driven scenario, both the direct GVA and the multiplier value could almost double by 2023; the technology-driven path would result in an annual GDP surplus of almost HUF 4 thousand billion by 2023, which - at the current level of redistribution - would mean an annual tax revenue surplus of over HUF 1 800 billion compared to the organic path.

1.3.2. Social significance

1.3.2.1 Labour market, skills of citizens

The crisis caused by the coronavirus and the response the government and economic actors gave to it clearly demonstrate that digital technologies, the use of services available remotely on the internet, teleworking can no longer be ignored in nearly the entirety of white-collar jobs, and that blue-collar workers are also affected by this labour market phenomenon. ICT skills are now one of the most important competences in the workplace, and the crisis only reinforces this.

The study commissioned by Neumann János Nonprofit Kft., entitled "Analysis of support programmes for digital skills development and proposal for new support schemes", based on previous analyses, assesses the factors that make digital competence particularly important both in private life and at work. The study suggests that social groups that do not use digital tools and lack such skills are already at a serious competitive disadvantage compared to their more skilled peers. The ability to use digital tools is a prerequisite for an increasing number of jobs, and the lack of such knowledge and skills is a permanent and growing source of disadvantage for marginalised groups. Access to information needed for everyday life, for learning or for work, and the use of digital tools and services

improve the quality of life and the employability of people irrespective of their financial situation. In many sectors, development has brought, or will bring, changes that will alter employment relations and the needs in terms of numbers and competences of employees.

The employability of workers who do not use digital tools and applications is declining day by day, as is the competitiveness of businesses that remain digitally excluded.[14] Between 20 and 25% of European adults aged 16 to 65 who have poor digital skills (among others) are at higher risk of becoming unemployed. They are at greater risk of poverty and social exclusion, as well as an increase in health risks and a reduction in life expectancy. These factors negatively affect the employability of individuals, the efficiency of an economy and the integrity of a society. Developing digital skills has a positive impact on competitiveness and employment at the level of citizens, businesses and public administrations, and contributes to macroeconomic growth and the strengthening of equal opportunities.

The 2019 report by PwC[15] looked at the impact of artificial intelligence (AI) on the labour market and found that over the next 15 years, 900,000 jobs could be affected by technological change in Hungary alone. This impact can be mapped also to other related digitalisation technologies, thus the labour market benefits of digital transformation in the Hungarian economy are estimated to be in the order of millions of euros.

1.3.2.2 Education

In the past years and decades, digitalisation and digital solutions have appeared in educational institutions too, as processes aimed at improving the efficiency of learning. As digitalisation transforms the way people work and the expectations around working, it should play an important role during the school years as part of the preparation of students for the labour market. The changes brought about by ICT place greater emphasis on the use of digital pedagogical methods, in addition to the previous classroom-based teaching methodologies. New technology and the modern methods will help students acquire the competences of lifelong learning through smart devices that can be used anywhere, learning materials and knowledge that can be accessed online, and the development of problem-solving skills. For this to happen, a change of attitude and mindset is needed among teachers and parents.

Throughout the outbreak of the coronavirus epidemic in Hungary (and in many other countries around the world), the education system tested distance learning methods, and key players in education (teachers, students, parents) were forced to learn how to use these technologies and systems, and now they can rely on this experience even when the pandemic is over. We should continue to work towards a system-wide integration of digital pedagogy in education.

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[14] Source: A medium-term concept for the development of digital competences of the population, Progress Consult, 2018

[15] Source: PricewaterhouseCoopers (PwC): How will AI impact the Hungarian labour market?, 2019, https://www.pwc.com/hu/en/publications/assets/How-will-AI-impact-the-Hungarian-labour-market.pdf

1.3.2.3 Research

In addition to the specific R&D&I topics relevant to the ICT sector listed in section 1.3.1.3, one of the digitalisation topics having a significant impact on the whole Hungarian research sector is computational modelling. High performance computing capacities (HPC) extensively available in Hungary facilitates more effective complex system modelling and replace material intensive experiments in several research areas. Super computers are becoming increasingly dominant instruments in generating (natural) scientific results as a considerable portion of the results are achieved on them, mostly replacing laboratory experiments. The availability of adequate HPC capacities of adequate quality and volume is a prerequisite for the value creation potential of the Hungarian scientific society and research sector.

1.3.2.4 Equal opportunities

The expansion of digitalisation will promote digital equal opportunities for people living in isolation, the socially disadvantaged and people with disabilities, and increase equality of opportunity in terms of access to education. Thus, it also helps to improve the quality of life by breaking down the barriers linked to physical mobility and geographical distances.

1.3.2.5 Law enforcement, public safety

Accessibility to electronic devices and services, and an advanced IT background can improve the efficiency of law enforcement activities, reduce the response time of criminal investigation agencies and accelerate the operation of justice. However, it is important to ensure that human and privacy rights are not compromised by digitalisation, and that there is room for privacy.

1.3.2.6 Environment protection, green transition

The favourable environmental role of the digital ecosystem may be captured primarily in the reduction of travel expenses, optimisation of energy networks and energy consumptions (intelligent electricity energy network, intelligent measurement), in the IT dominance of transport systems (intelligent transport systems), in intelligence solutions, valid at the level of settlements and buildings (intelligent town, intelligent office, intelligent home: lighting, heating/cooling systems, access authorisation systems, security systems, etc.), and in the development of the "green IT" technologies, which is a summary concept reflecting the efforts towards low energy consumption and the use of materials and technologies with little impact on the environment.

Agri-digital solutions and precision technologies will optimise yield- and nutrient content-based crop production, pesticide and fertiliser use, based on the needs of plants and animals and the condition of the environment (soil, water, weather), thus contributing to the reduction of the sector's environmental footprint.

1.3.2.7 Household finances, revenues

The availability of ICT devices and services (e.g., e-commerce, e-government services, etc.) generates financial savings for households through the reduction of travel, waiting and other expenses, and also due to the price reduction resulting from a greater choice, and greater competition without any physical distance (e.g., by benefiting from the price comparative options). In a household the total savings which can be achieved

with conscious internet use can significantly exceed the internet subscription costs and the amount invested into the computer.

1.3.2.8 Healthcare

Digitalisation of this area is essential to improve the operational efficiency and healthcare processes of the institutions. Broadband networks play a key role in enabling remote diagnostic and monitoring systems; since high bandwidth networks allow the secure and fast transmission of diagnostic medical records, X-rays, etc. The use of remote monitoring applications is equally important, providing safety for patients and significant cost savings for the healthcare system (by reducing unnecessary doctor-patient encounters). In the area of R&D&I, the growing role of IT and engineering solutions supporting healthcare, the potential of big data analysis, biostatistics, ICT solutions supporting the spread of healthcare robotics, as well as skilled human resources, should be highlighted.

1.3.2.9 Quality of life

When used appropriately, all components of the digital ecosystem improve the quality of life (e.g., simpler, easier contact, time and energy savings, simpler and better access to information channels, presence on the labour market, improving position at work, increasing use of online services, higher level of self-care, easier orientation, etc.), and the same is especially true for the disadvantaged groups of society. At the same time, it is important to address the digitalisation-related vulnerability of individuals, the negative effects of being technology dependent (e.g. sitting in front of computers for too many hours, social isolation, the dangers of social media) and also the gaps that are emerging in this area.

1.4. Identification and explanation of the pillars

Each part of an ecosystem is made up of elements that interact closely with each other, have a continuous influence on each other, and elements that cannot exist without each other (not even in the short term). This strategy follows the pillar structure defined by the National Infocommunications Strategy as follows:

PILLAR I

Digital infrastructure: availability of the electronic communications infrastructure with a bandwidth required for the supply and use of digital services in all segments of the network;

PILLAR II

Digital competence: development of the digital competences of the population, micro, small and medium-sized enterprises and public administration employees, reduction of the primary (digital illiteracy) and secondary (basic/elementary digital skills, ‗low degree of utilisation) digital divide, enabling micro and small enterprises and public administration employees to recognise and leverage business opportunities resulting from the introduction of ICT systems and digital technology solutions;

PILLAR III

Digital economy: on the one hand, the ICT sector in the narrower sense, and related R&D&I, on the other hand, the external and internal IT systems of enterprises using the digital services provided by the sector (e.g. business administration, business, internet, etc.), and the data economy;

PILLAR IV

Digital state: as a separate pillar, the government, and in a broader sense, the internal IT supporting the functioning of the state, electronic public administration and e-administration services for citizens and businesses, other digital public services of public interest (e.g. healthcare, education, libraries, cultural heritage or other services aimed at sharing public data and information assets) and the related information security.

1.5. Methodology

When preparing this strategy international standards for government strategy making were followed, both as regards the process of strategy development and the structure and content of the document.

The process of preparing the strategy:

- **Definition of the structure of** the strategy,

- **Identification of** the **methodological elements** (e.g. Secondary analysis of sources[16], analysis of statistical data, formulation of primary research, drafting of expert interview schedule and list of interviewees, etc.) required for the preparation of each chapter,

- **Developing** of the **content of each chapter**,

- **Conducting expert interviews** required for the relevant chapters, processing and incorporating into the document the information thus gathered,

- **Conducting industry consultations, professional workshops** with public administration, market and civil/professional actors working in the digital ecosystem,

- **Revision of the content of the first version (v1.0) involving the ministries concerned**, processing the recommendations given and incorporating them into version v2.0,

- **Publication of version v2.0 on www.kormany.hu** in order to carry out the necessary public consultations and to process the recommendations received and integrate them into the document,

- **Discussion of version v3.0 at a meeting held at the level of State Secretaries for Public Administration**,
  implementing any amendments or recommendations,

- **Discussion and adoption** of the final version **by the government. Structure and content of the strategy**

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[16] The list of the documents processed is provided in the Annex.

- the **introduction** part specifies the **motive** of the strategy (why) and its **mandate** (the application authorisation), followed by the **interpretation and specification** of the subject matter of the strategy, presenting the **economic and social importance of the sector**, the **methodology** features of the strategy and, finally, explains the **pillars**;

- the **situation analysis** provides a **detailed** analysis **by pillar**, covering both the supply and demand side;

- the **SWOT** analysis lists the strengths and weaknesses, opportunities and risks identified in **each pillar**;

- the **vision** and **objectives** chapter summarises that, compared to the current situation what **vision** is used as the starting point for setting the goals;

- the identification of the gaps between the vision and the current situation is the basis for setting the **objectives of the strategy**, at the highest level there are the complex strategic goals, and they are elaborated and specified by the objectives by pillars;

- the **strategic tools**, established also by pillar, serve the implementation of the pillar objectives; in that system, the tools are classified according to their type (regulatory, public policy and fiscal/support tools); the chapter is completed by the illustration of the **correlations between the strategic objectives and tools**, thus, it can be verified that all the strategic objectives set are associated with tools and that each identified tool contributes to one or more strategic objectives;

- the **institutional system and monitoring system** is responsible for identifying the institutional actors (governmental, civil) involved in the implementation of the strategy, defining their tasks and monitoring the results and impacts of the strategic interventions on the basis of the accounting system set out in the situation analysis.

Figure 10: Structure of the National Digitalisation Strategy
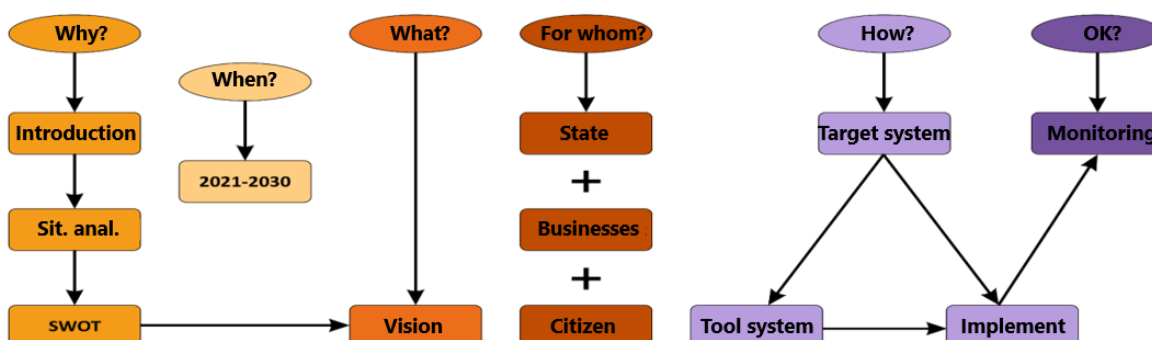
2. Situation analysis

2.1. Approach

The current situation of digitalisation in Hungary is presented along the selected pillars with the help of statistics suitable for international comparison.

First, we analyse the qualitative and quantitative parameters of the digital infrastructure indispensable for all segments of the digital ecosystem, followed by the analysis of the indicators of the digital and media competences, the digital economy and the digital state – using data sources that are suitable for international comparison.

The situation analysis chapter was prepared with the parallel analysis of the demand and supply side for each pillar. Following the processing of the secondary sources, the analysis discloses the most important problems and inadequacies of the demand and supply sides of each pillar, which are also included in a consolidated structure, supplemented with strengths and opportunities, in the SWOT analysis chapter.

2.2. Situation analysis by pillar

2.2.1. Overview

Based on the DESI[17] 2022 country report, Hungary ranks 23th overall. When looking at the combined results, the pace of growth in Hungary is similar to that in the EU. During the last 5 years, Hungary has made the most significant progress in the areas of connectivity (75% increase over 2016) and the integration of digital technologies in businesses (60.8% increase over 2016), while there is virtually no change in the human capital dimension and a smaller, albeit noticeable, increase in digital public services, or more specifically when comparing it with other countries.

2.2.2. Digital infrastructure

The Internet access dimension of DESI[18] measures the level of development of digital infrastructure in the Member States. DESI (in 2022) analyses the Internet access dimension along a total of 10 indicators:

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[17] For each of the four pillars (digital infrastructure, digital competence, digital economy and digital state), data from the DESI 2022 report are presented, as well as data from the Key Indicators document at certain places. Key Indicators data mostly cover the period 2015-2020 (in one case 2014-2019). The results of the Key Indicators are presented in cases where no DESI indicator was available for 2021 due to the change in methodology.

[18] Source: European Commission: The Digital Economy and Society Index (DESI) 2022, Country Report, Hungary, https://ec.europa.eu/newsroom/dae/redirection/document/88704

Table 1: Hungary's situation according to the DESI Connectivity indicator, 2022

Connectivity (25%)	DESI 2022 value 🇭🇺	DESI 2022 value 🇪🇺
DESI Connectivity dimension - *components and their current value*	**57.6**	**59.9**
2a1 Overall fixed broadband take-up (% of households)	83.3%	77.8%
2a2 At least 100 Mbps fixed broadband take-up	61.5%	40.6%
2a3 At least 1 Gbps take-up	21.8%	7.58%
2b1 Fast broadband (NGA[19]) coverage	96.7%	90.1%
2b2 Fixed Very High Capacity Network (VHCN[20]) coverage	78.6%	70.2%
2b3 Fibre to the Premises (FTTP) coverage	64%	50%
2c1 5G spectrum	60.3%	56.1%
2c2 5G coverage	17.6%	65.8%
2c3 Mobile broadband take-up (% of individuals)	84.4%	86.5%
2d1 Broadband price index (Score (0-100))	70.1	72.6

Source: DESI 2022

In the following, we present the indicators that show the quantitative and qualitative parameters of the current broadband infrastructure in Hungary and demonstrate why the state should continue to play an active role in broadband development in the coming years to ensure that all citizens have access to modern digital infrastructure.

Hungary ranks 13th in terms of internet access in 2022.

Figure 11: DESI connectivity dimension data, Hungarian and EU average, from 2017 to 2022

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
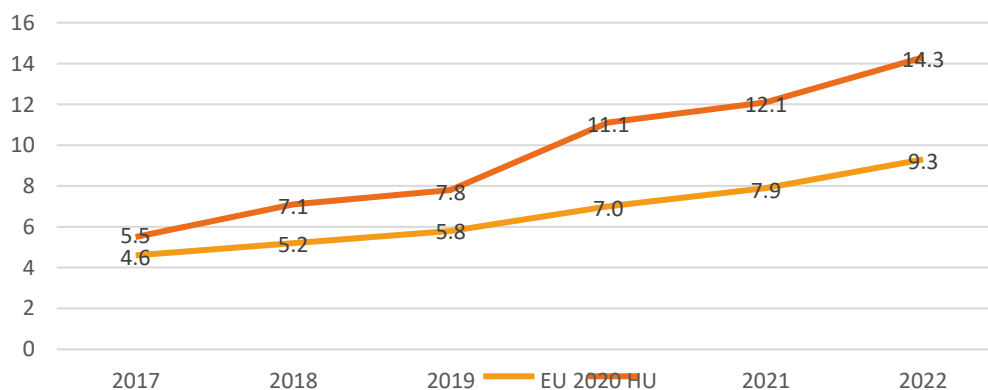
For the **fixed broadband** component, the Hungarian figure is more than 5 percentage points higher than the EU average (77.8%), with 83.3% of Hungarian households using fixed broadband internet services.

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[19] Next Generation Access

[20] Very High Capacity Network

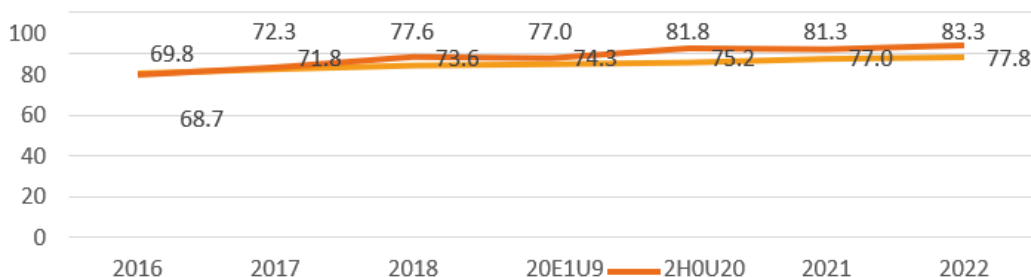**Figure 12: Evolution of fixed broadband take-up (Hungary and EU average, 2016-2022, % of households)**

Source: https://digital-agenda-data.eu/datasets/desi/visualizations

Based on the results of the 2021 NMHH representative survey[21], 72% of households have fixed internet access. Of those households without fixed internet, the reason for not having a fixed internet service is lack of need: 74% of those surveyed said they did not need a fixed internet service. The reasons for this are that they are either replacing the service with mobile internet or not using the internet at all.

Hungary's **superfast broadband take-up (100 Mbps or more)** has been higher than the EU average over the past 5 years. Hungary ranks 4th in terms of at least 100 Mbps fixed broadband take-up22.

Figure 13: At least 100 Mbps fixed broadband take-up2 (Hungary and EU average, 2016-2022, % of households)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
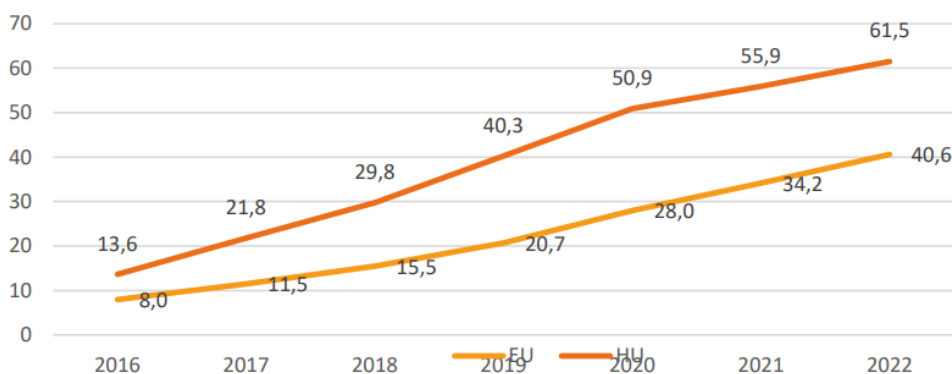
The largest difference in the **take-up of ultra high-speed (above 1 Gbps) broadband internet services** among all DESI indicators (being a difference of more than three times) is in favour of Hungary, leading ahead in the EU (21.8% /7.6%)[23].

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[21] Source: https://nmhh.hu/cikk/220966/NMHHkutatas_miert_nem_internetezik_mindenki
[22] Source: https://digital-strategy.ec.europa.eu/en/policies/desi
[23] Source: https://digital-strategy.ec.europa.eu/en/policies/desi

Figure 14: Broadband internet take-up above 1 Gbps (Hungary and EU average, 2020-2022, % of households)

Source: *https://digital-agenda-data.eu/datasets/desi/visualizations*
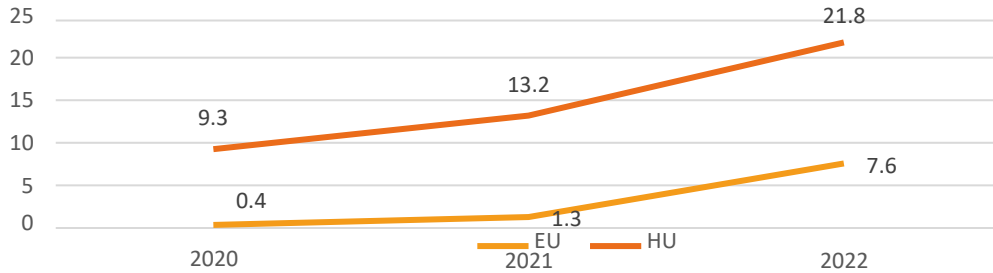
High-speed broadband (NGA) coverage in Hungary has improved by 11 percentage points compared to 2016, with 96.7% of households now enjoying internet services with a bandwidth of 30 Mbps or more, this being above the EU average of 90.1%.

Figure 15: High speed broadband (NGA) coverage (Hungary and EU average, 2016-2022, % of households)

Source: *https://digital-agenda-data.eu/datasets/desi/visualizations*
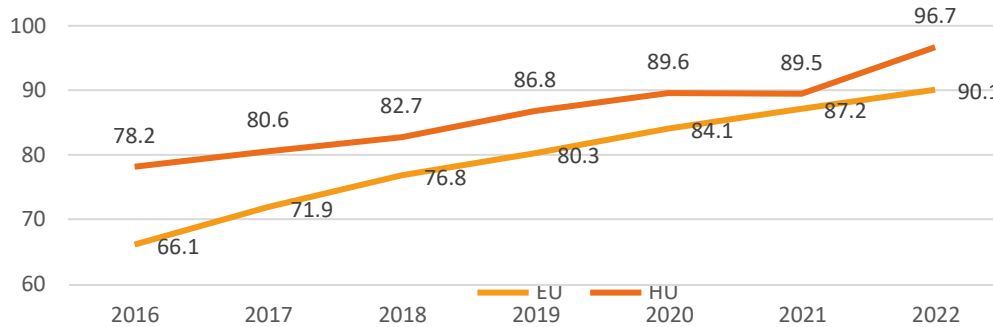
Very high capacity fixed networks (VHCN) are available to 78.6% of Hungarian households. The number of households covered has doubled in the last 5 years. In order to achieve the EU objectives, it will be necessary to promote VHCN coverage in the coming years, since, as in the case of NGA deployments, the coverage of hundreds of thousands of households will not be possible on a purely market basis, i.e. some extent of public intervention will definitely be needed.

FigurFigure 16: Very high capacity fixed network (VHCN) coverage (Hungary and EU average, 2016-2022, % of households)

Source: *https://digital-agenda-data.eu/datasets/desi/visualizations*
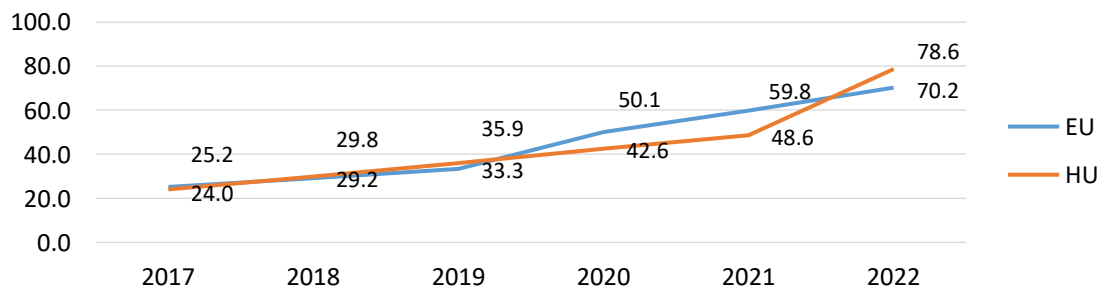
4G coverage in terms of the percentage of households is 99.3%, just slightly below the 99.7% level of EU Member States, showing a slight increase compared to 2020. Mobile broadband take-up is not significantly below the EU average: according to the DESI survey, the EU average is 86.5%, while the Hungarian figure is 84.4%.

A change in methodology has been introduced for **mobile broadband take-up** : on the one hand, this indicator is now also measured by a questionnaire (as opposed to the data reported by service providers in previous years), on the other hand, the indicator measures usage, not the number of data-enabled SIM cards a person possesses. Recent years have brought significant changes in Hungary, ringing the country to a level just slightly below the EU average.

Figure 17: Mobile broadband take-up (Hungary and EU average, 2016-2022, in % of private individuals)

Source: *https://digital-agenda-data.eu/datasets/desi/visualizations*
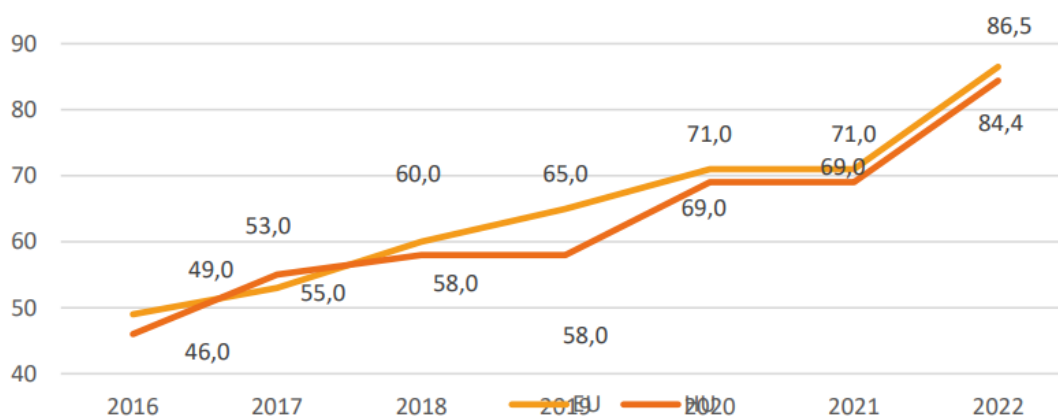
There has been no progress as regards the **5G spectrum** compared to 2020, at last year's spectrum auction, 5G frequencies were all sold, with the exception of 26 GHz, to be sold in the coming years.

Figure 18: Change in 5G readiness (Hungary and EU average, 2019-2021, allocated spectrum as a proportion of the total harmonised 5G spectrum)

Source: *https://digital-agenda-data.eu/datasets/desi/visualizations*
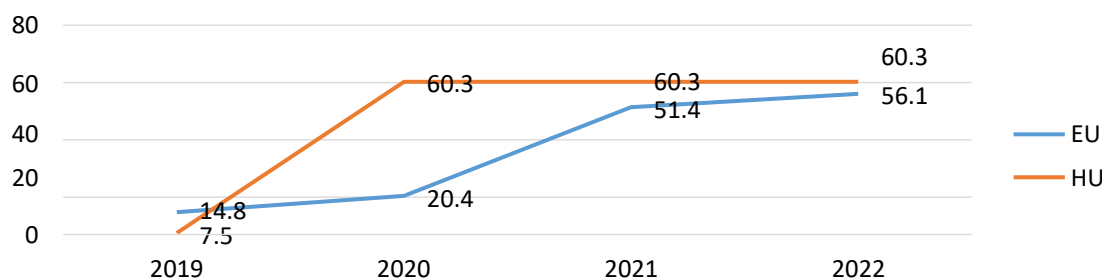
The 2022 report has introduced a new indicator: **5G coverage**. The Hungarian figure is 17.6%, compared to the EU average of 65.8%, indicating that 5G network deployment based on the spectrum sold could gain momentum in the coming years.

As regards the **broadband price index indicator**, Hungary has been performing typically in line with the EU average over the last three years. Hungary ranks 12th among EU Member States as regards internet services.

2.2.2.1 Superfast Internet Programme (SZIP)

When analysing the situation, it is important to consider how government measures have helped in achieving these results. The programme SZIP was launched at the end of 2014 by the Government Decision 1631/2014 (XI.6) on the implementation of the "Digital National Development Programme", then **aiming to ensure Hungary's full coverage** with broadband internet networks **offering speeds of at least 30 Mbps**.

SZIP was implemented in two separate units supporting each other:
- **by means of tenders supported by European Union and domestic funding**
- **and through a series of rounds ensure legal accessibility.[24]**

The GINOP 3.4.1 and the KMR tender financed from the national budget aimed to provide non-reimbursable support for Hungarian private enterprises and international enterprises providing Internet services in Hungary to extend network coverage to previously uncovered, commercially unprofitable, typically remote residential areas.

Up to May 2021, **five full rounds of calls for proposals** were completed. The total amount of grants awarded so far has exceeded **HUF 70 billion.** Out of a total of 218 active projects, 132 have been completed so far (August 2022), with the following results and progress:

- places of demand undertaken to be covered (IGH): 472,553
- service (subscriber) end points (SZVP) undertaken to be covered: 499,949
- IGHs completed: 251,715
- SZVPs completed: 273,937

The developments implemented will result in the construction of nearly 18.2 thousand km of new fibre optic network. State-of-the-art FTTH technology was used in 86% of the SZIP developments. The coverage rate of networks capable of gigabit speeds exceeded 58% in 2021. By the time the programme is completed, a total of 983,000 places of demand will have NGA coverage as a result of the developments.

Technical assistance and expert advice mechanisms, such as the Broadband Expert Service

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[24]
- Simplification, rationalisation of construction rules applicable to telecommunications installations, one-stop shop for procedures
- Review of the tax system (utility tax, development tax relief) and the system of procedural/administrative fees in the context of accessibility of the regulatory environment
- Identifying market regulation issues (e.g. defining open access) - however, market regulation is a separate competence under NMHH (National Media and Infocommunications Authority)!
- transposition of Directive 2014/61/EU (partially covering the areas of intervention, however, it goes beyond that!)

The operation of the Hungarian BCO (Broadband Competence Office) meets the criteria set out on the ec.europa.eu website operated by the European Commission. The competent bodies for network development strategy and policy in Hungary are the Cabinet Office of the Prime Minister (MK), the National Media and Infocommunications Authority (NMHH) and the Government Information Technology Development Agency (KIFÜ) operating under the supervision of MK. In its role as BCO, KIFÜ is responsible for the implementation of IT and infocommunication projects related to central public administration, a prime example of which is the programme SZIP.

KIFÜ's role as BCO is presented by the SZIP website, where KIFÜ helps the preparation for the broadband network planning of the new financial cycle through EU training (workshops and webinars) for BCO members in Hungary, and also through national events (e.g: CEF 2.0 workshop). In the BCO network, Hungary is represented by two officers from the KIFÜ SZIP Programme Office staff.

During the operational programming related to network development, the BCO executive operations are supported by independent civil society actors and professional organisations (examples: Hungarian Chamber of Engineers, Scientific Association for Infocommunications [HTE], Hungarian Association of Digital Companies [IVSZ], Communications Reconciliation Council [HÉT]). The expertise that can be implemented will be integrated into the operation of the BCO, in addition to consultancy support, task provision focused on technical consultancy will help in the implementation of gigabit-enabled network development - thus helping to meet EU's gigabit objectives in Hungary. A prime example for cooperation between the BCO and professional organisations is the cooperation with the Hungarian Chamber of Engineers to ensure a pool of design engineers needed for the design of the broadband networks being deployed.

2.2.2.2 Mapping existing private and public infrastructure and service quality

The existence of a high-capacity and high-quality digital communications infrastructure is essential for the development of the digital economy, the digital well-being of citizens and the provision of efficient and modern digital services. It is equally important for economic and business competitiveness, education, health, equal opportunities and employability considerations. Currently, there is no electronic register available either for government bodies (Cabinet Office of the Prime Minister, Government IT Development Agency, Lechner Knowledge Centre) or for the National Media and Infocommunications Authority to help them determine the available capacity of the cross-sections of the network infrastructure deployed. Consequently, there may have been alternative network infrastructure investments - based solely on market considerations - or no investments at all due to lack of information.

For Hungary, it is a priority to be the first among the EU Member States to deploy an ultra-high bandwidth - gigabit-capable - data transmission network that meets the VHCN criteria published by BEREC and supports the roll-out of 5G in Hungary. Looking ahead to 2030, there should be no congestion on this network that would prevent end-users from enjoying the full capacity of data traffic. The resulting development will be able to serve in the long term the ever-increasing demand for bandwidth by the population, businesses and public institutions, and to meet market and societal needs, while providing a competitive advantage for the Hungarian industry, agriculture and Hungarian businesses. The deployment of high-capacity networks is essential for the development of the digital ecosystem.

For the continued development of the communications infrastructure, it is desirable to create a registration system to support tendering, suitable for full-scale supporting of the tendering of wireline and wireless communications networks by, among other things, recording basic technical specifications, network plans, available capacities and other qualitative and quantitative data in relation to the commitments and deliverables submitted in the course of the tendering process. This could be complemented by the development of a gap-filling register of technical descriptive data concerning all existing electronic communications facilities and other utility network infrastructure, which would allow the identification of spare capacity for deployment. Such a registration system, based on the results of existing registration systems, is able to visualise data in a way that allows the elements of the network infrastructure to be stored and analysed. The resulting database can be made available - under certain terms and conditions - to all actors involved in network development.[25]

The background to online mapping data collection is defined below. This is followed by a presentation of the results of mapping, its potential and a clear identification of investment shortfalls.

Data collection is carried out by the National Media and Infocommunications Authority on an annual basis, as part of the mandatory data collection for companies that own electronic communications infrastructure, to provide a basis for the mapping of the development of the domestic gigabit-capable network and broadband infrastructure[26]. NMHH, as the body responsible for the implementation of fixed and wireless electronic communications and wireless broadband strategies in Hungary (e.g. in its role as a frequency allocator), monitors and analyses the functioning of the communications market in order to inform policy decisions. Data provision to measure broadband fixed internet network coverage and availability (access network) is called "online mapping", which is a data collection exercise that reveals the basic data describing the electronic communications network in Hungary at annual intervals, and on the basis of which gigabit coverage can also be presented. Data is available via an online interface, with predefined address-level tables.

During the data provision, all undertakings and network providers involved in the provision of fixed Internet access services must provide data on the basis of a predefined list of places of demand[27]. Data provision covers the following:

- coverage of a specific network place of demand for internet access (yes/no),
- number of endpoints actually served at a given place of demand (pieces),
- type of technology used to provide internet access (e.g. FTTB, FTTH),
- theoretical download bandwidth (Mbps) available at the point of demand, and

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[25] As from 2023, OLM data reporting will be replaced by a geographic survey required by the European Telecommunications Code ("Code") and mandatory for national communications authorities under Article 83/C of the Act on Electronic Communications (ECA), which will also cover the assessment of the coverage of fixed networks at address level and will also include the mapping of mobile network coverage. Data will have to be reported annually and will also cover planned developments. As required by the Code, Member States will use the geographical survey when preparing their network development support schemes.

[26] For a more detailed description of the parameters of online mapping data collection, see the dedicated page of NMHH on communications supervision: https://nmhh.hu/szakmai-erdekeltek/hirkozles-felugyelet/online-mapping Date of download: 08/09/2022

[27] A place of demand is a street-level address at which a potential demand for ICT services may be expressed by a residential, business or public entity residing there.

- a statement that the contacted undertaking is the owner and operator of the network section at the relevant endpoint, or only the operator of the network section at the relevant endpoint (in which case the name of the network owner is also recorded).

When reviewing the results of the data collection, it is worth mentioning that 2015 was the first year when the Hungarian access network was surveyed as outlined above. As a result, the group of places of demand to be developed - identified in GINOP 3.4.1- 15, SZIP-KMR and later in GINOP 3.4.1-20, which later became part of the SZIP development - was identified Subsequently, in 2018, 2019, 2020 and 2021, online mapping provided information on the performance of the Hungarian access networks and baseline data describing the aggregation network are also included in the monitoring.

The diagram below illustrates the normalised results of data collection cycles and the effects of SZIP developments. It should be pointed out that the conceptual framework of data collection classifies a demand site into a specific theoretical download speed category if Internet access service is available at the given address and the subscriber demand can be met within 15 days starting from the date of the request.

Figure 19: Coverage of places of demand in the light of the 2015 mapping and the four subsequent online mapping data collections

Percentage of places of demand with internet service of at least the specified speed (%)
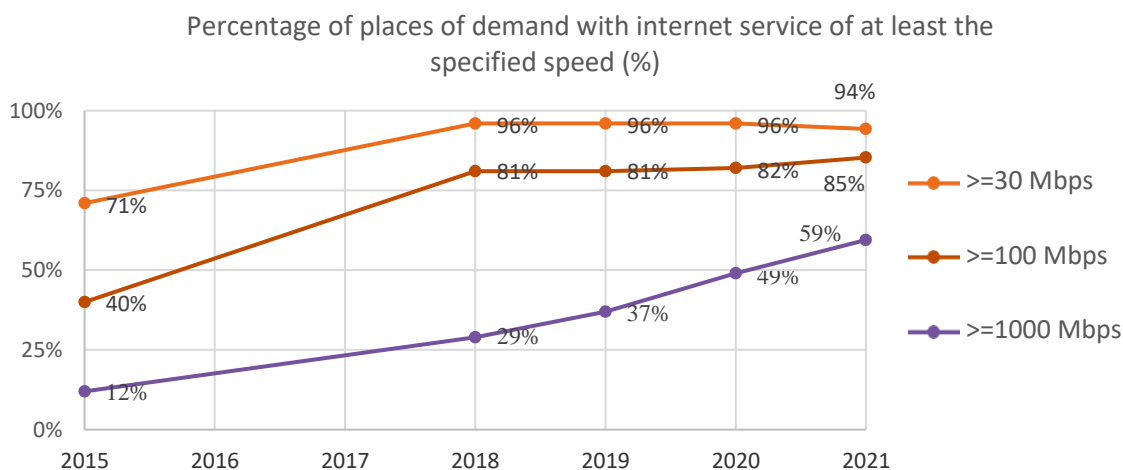
Source: ITM, online mapping report 2022

Based on the mapping values (normalised after data cleansing) for 2015, aggregated on a national level, access networks capable of theoretical download speeds of at least 30 Mbps covered 71% of the places of demand in Hungary, while technologies capable of up to 100 Mbps covered only around 40%. In 2015, the local networks that are today considered to be the most future-proof - predominantly FTTB or FTTH - were available in only 12% of the places of demand in Hungary. The effects of GINOP 3.4.1-15 and SZIP-KMR[28] are now clearly visible after the 2018 survey. The places of demand covered by the access network capable of speeds above 30 Mbps at that time provided almost full coverage. Solutions capable of serving the theoretical download speed of 100 Mpbs also enjoyed significant growth between 2015 and 2018. The uptake of gigabit-capable access networks was also outstanding

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[28] A nationally funded broadband development tender for the Central Hungary region.

in this period, whereas in this most forward-looking category, it is the 2019-2020 reports that show the most significant progress.

By 2022, 30 Mbps Internet coverage basically covers the entire address base (97%), within the margin of error. This is not far behind the proportion of places of demand covered by access technologies offering speeds of at least 100 Mbps (82%). Access technologies capable of theoretical download speeds of 1000 Mbps or more account for 64% of the places of demand. The significant increase in the period under review is also due to the aforementioned GINOP 3.4.1 developments, in addition to developments by service providers, and has resulted in this extensive and high-speed telecommunications infrastructure coverage. By 2021, the proportion of places of demand covered by internet services offering >=100 Mpbs and access technologies capable of >=1000 Mbps theoretical download speeds increased further. Hungary currently ranks highly in terms of fixed internet speeds, even by international standards[29].

At the same time, as a part of the presentation of the mapping results, **the potential areas and extent of gaps should be identified**. From the online mapping data, considering the directions of digital infrastructure development, it is also worthwhile to display the proportions of served or potentially served places of demand in the category of theoretical download speeds reaching or exceeding 1 gigabit. The data captured during the online mapping 2018-2020 shows the following picture.

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[29] In a generally accepted site for ranking internet speeds, Hungary is ranked 14th out of the 181 countries reviewed, according to data available. Source: https://www.speedtest.net/global-index Date of download: June 2022

Figure 20: Broadband mapping - coverage in Hungary
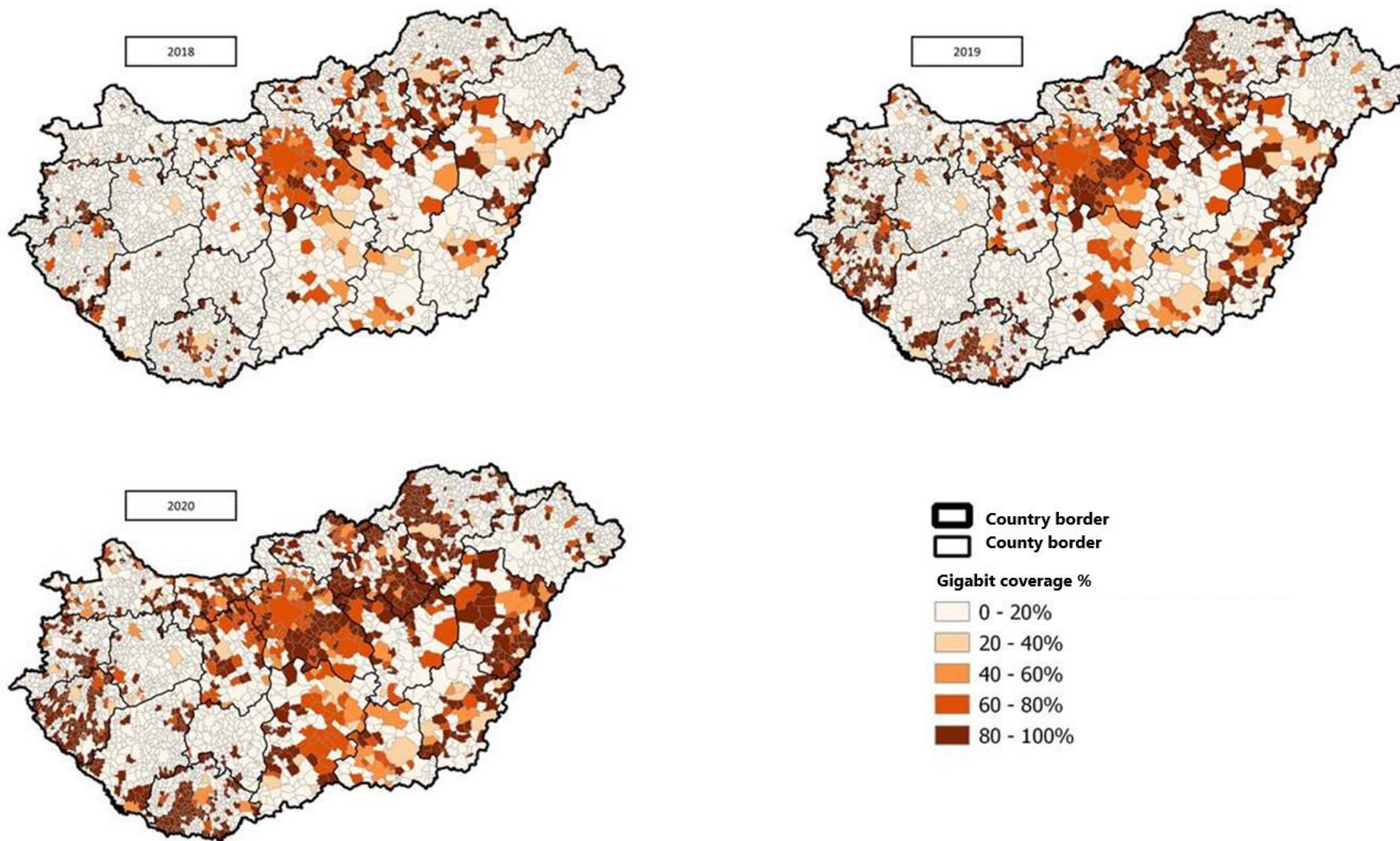
Source: ITM, online mapping report 2021

Hungarian district coverage average based on Online Mapping 2021

Coverage

✓		<80%
✓		80% - 90%
✓		90% - 95%
✓		95% - 99%
✓		99% - 100%
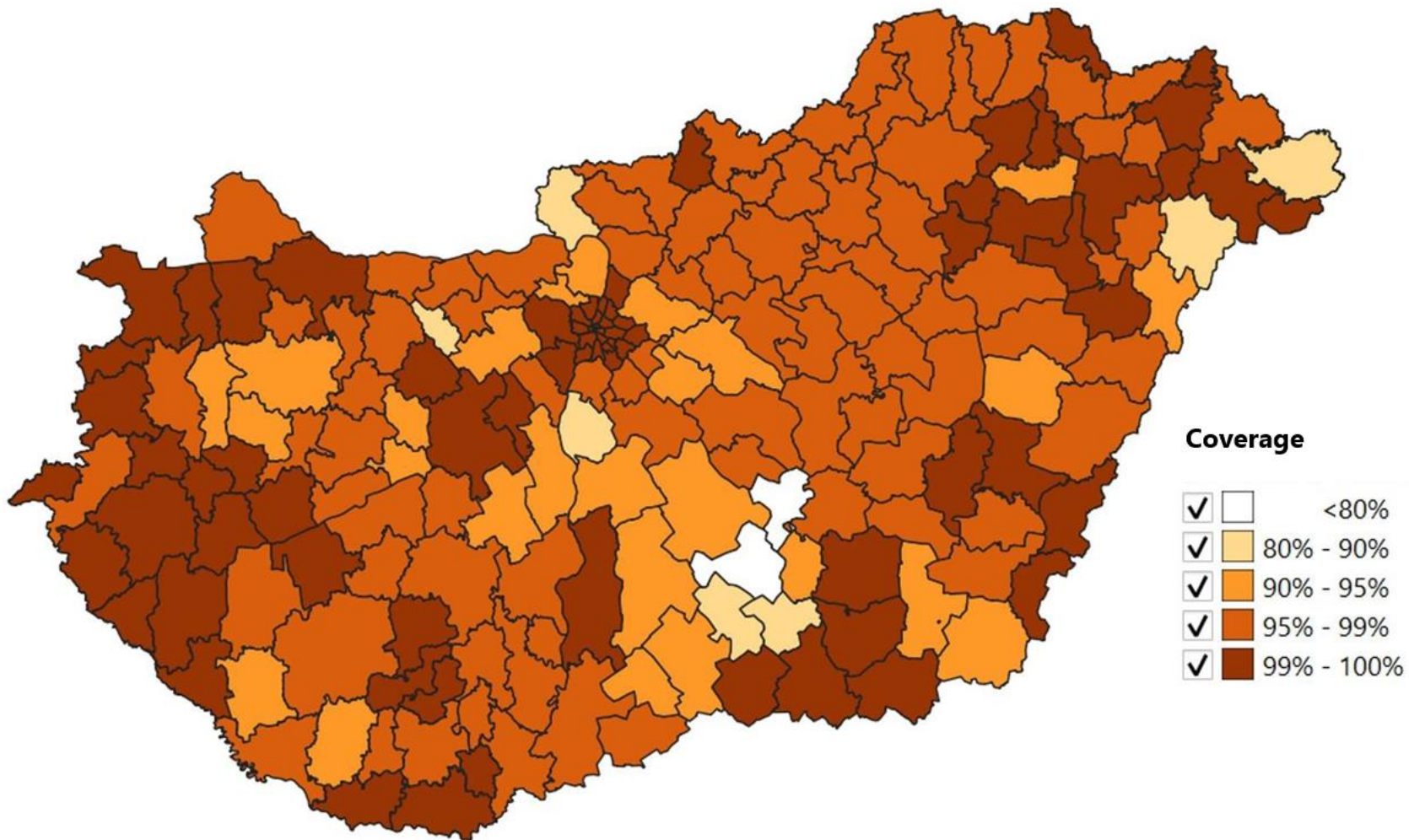
Source: KIFÜ, online mapping report 2022

Over the four time points, there is a clear dynamic of increasing gigabit coverage as a proportion of places of demand of Hungarian settlements. While the progress is impressive, two phenomena are worth highlighting.

On the one hand, the spread of future-proof technologies (FTTB, FTTH, RFoG technologies) is clearly concentrated along specific core areas. This concentration thus demonstrates the justification for the GINOP-3.4.1-15 call for tenders, stating that the "market failure that hinders infrastructure deployment is that it is not profitable for the private sector to deploy broadband infrastructure in less developed, low population density or poverty-stricken areas". Making areas of market failure accessible via gigabit-capable access benefits not only the national economy, but also the environment and the society.

On the other hand, although the maps presented show an encouraging rate of expansion, this rate of expansion is far from being sufficient to meet the specific target value "DI1: Proportion of households covered by a gigabit-capable network to reach 95% by 2030". Public policy intervention, beyond market processes, whether based on Community funding or pure public funding, therefore reveals investment needs justified by the need to achieve the vision defined jointly by the strategic thinking of Hungary and EU objectives.

2.2.2.3 Consultation on planned investments that comply with state aid requirements

Consultations with the public, municipalities and telecommunications operators on investments planned in line with state aid requirements were also carried out within the framework of the aid schemes already mentioned. In each case, a consultation period precedes the calls for proposals for development, during which the government seeks input from stakeholders - including residents, municipalities and telecommunications operators - to help clarify the data that will underpin investment in the coming years. This nationwide database refines the coverage map of new generation networks, potentially adding new addresses (which may also be announced as new places of demand).

Most recently, in 2020[30], the Ministry of Innovation and Technology (ITM) launched an online consultation, where citizens could report by 8 August 2020 via szipkonzultacio@kifu.hu if the addresses on the SZIP consultation map that are not currently covered by broadband internet are different from what they experience. The outcome of the consultation map are available at this link: https://dashboard.kifu.hu/szip/map.

The detailed address list can be found in the Excel table on the coverage, available on the following page: https://kifu.gov.hu/szip/konzultacio. On this web page, anyone can search for their place of residence and see where households without broadband internet service (not covered) are located at a given address according to the database. Participants can comment on the quality of the service by filling in the coverage table.

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[30] The broadband coverage survey, closed on 8 August 2020, had been preceded by a former consultation at the end of 2019. The available register is based on data provided by companies operating communications networks in Hungary.

2.2.2.4 Harmonisation of EU legislation for communications

The EU Directive 2014/61/EU on the promotion of the deployment of high-speed electronic communications networks is the basic document of the regulatory environment for the deployment of electronic communications networks. By establishing minimum rights and obligations applicable throughout the European Union, this Directive aims to facilitate the deployment of gigabit-capable electronic communications networks and cross-sector coordination.

The Directive has been transposed in Hungary. In order to facilitate access, the transposed Directive states that all network operators have the right to grant undertakings providing electronic communications networks access to their physical infrastructure for the purpose of deploying elements of high-speed electronic communications networks. In order to achieve this goal, detailed regulation was introduced in Act C of 2003 on Electronic Communications (hereinafter referred to as the ECA). The network operator shall, on fair and reasonable terms (such as fair pricing), meet reasonable requests for access to the physical infrastructure for the purpose of installing elements of high-speed, gigabit-capable electronic communications networks.

Specific measures focus on minimising the costs of network development.
The Directive sets out the essential elements of networking, such as:

  a) access to existing physical infrastructure (Article 90[1] of ECA);
  b) transparency as regards the physical infrastructure (Article 93/A[1] of ECA);
  c) physical/administrative coordination of construction works (Article 93[1-7] of ECA);
  d) transparency of construction works planned during the construction of the network (Article 93/A[5] of ECA);
  e) authorisation procedure (Article 95[3] of ECA); f) penalties (Article 48-50/C of ECA).

Telecommunications operators have the possibility to comment on the addresses that are not yet covered by broadband internet and the settlements that are not covered by optical fibre in their register, or to make a commitment for a self-funded (i.e. only self-funded) development.

2.2.2.5 Availability of devices

The primary research[31] conducted by Századvég Konjunktúrakutató Zrt. on various aspects of Internet use in Hungary, intended for internal use, found that smart phones are the most widely used digital device in Hungarian households. According to the survey, smart phone penetration per 100 inhabitants[32] calculating with an average of 2.5 devices per household is 85.7%. The majority of households also have a laptop (60.1%) and a smart TV (52.3%). Desktop penetration has declined significantly thanks to the growth in smart phone, laptop and tablet penetration. Slightly more than a fifth of households reported owning a wearable smart device or games console, while barely 9% of households own the device(s) needed for a smart home.

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[31] Population survey and analysis on internet usage, November 2020, Századvég
[32] According to KSH data, the number of households in 2019 was 4.12 million.

Figure 21: Which of the following devices do you have or does your household have, where you live? (mentions, %)
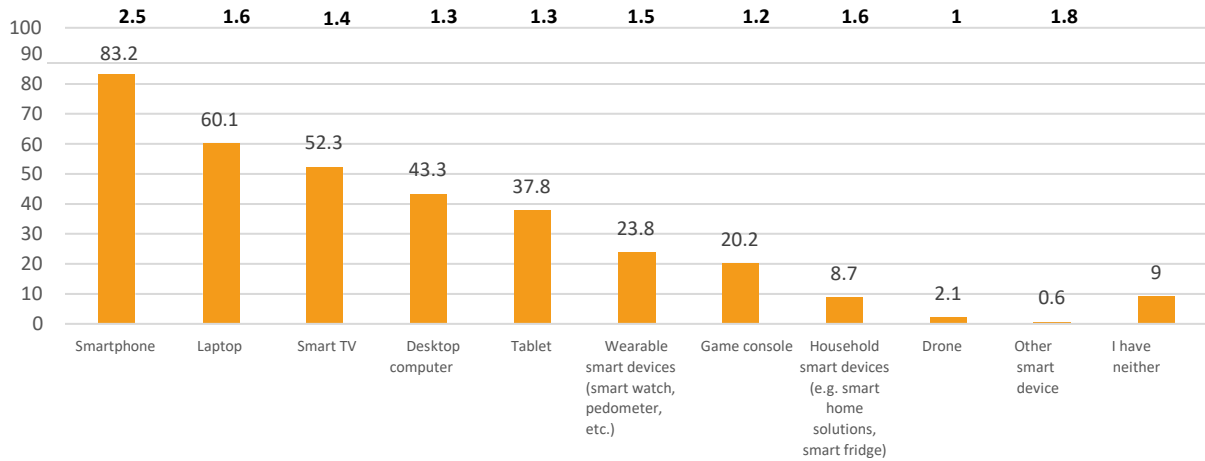
Source: Századvég

2.2.2.6 Basic infrastructure of public networks: National Telecommunications Backbone Network (NTG), Digital Success Backbone Network (DJG) and Student Network

The availability of a high-quality digital infrastructure is essential for the growth of the digital economy, the development of digital skills of both citizens and businesses, and the take-up of public digital services. In Hungary, the backbone communications infrastructure for a significant part of the **NTG** and **DJG** networks is provided by the free capacity of the optical network deployed on the Electric Energy System (VER) for the purpose of power system management. As a result of recent and ongoing developments, the number of interconnections between VER's optical network and other public optical networks (e.g. road, railway) is continuously growing, and the parts of the optical capacity developed in the SZIP project for use by the state are also becoming available. All these factors together make it possible to maximise the use of the free capacity of public or public-purpose fibre networks to achieve the goals of the Digital State.

The development of the NTG was performed by the Nemzeti Infokommunikációs Szolgáltató Zrt. (NISZ Zrt.) between 2013 and 2015, and its modernisation has been ongoing ever since. In addition to replacing obsolete equipment, the NTG project also aimed at improving the network and optimising its operation, resulting in an overall enhancement of the quality, efficiency and security of NTG voice services. Their ongoing projects include, among others, the Consolidation, capacity and performance of government networks (GINOP-3.4.2-VEKOP-15- 2016-00001) or the Network access and connectivity of institutions (GINOP-3. 4.5--VEKOP-16-2017-00001)[33]. These projects will provide a total of 3,300 new high-bandwidth network connections on the government telecommunications network and will contribute to an average bandwidth of at least 30 Mbps at network endpoints by the end of 2023. In addition to the development of endpoints, the projects will also ensure necessary aggregation network improvements.

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[33] Source: NISZ, 2016, Consolidation, capacity and performance enhancement of government networks, https://www.nisz.hu/hu/projektek/gerinchalozati_fejlesztesek

Figure 22: Network development for public authorities - progress

Government targeted network development results
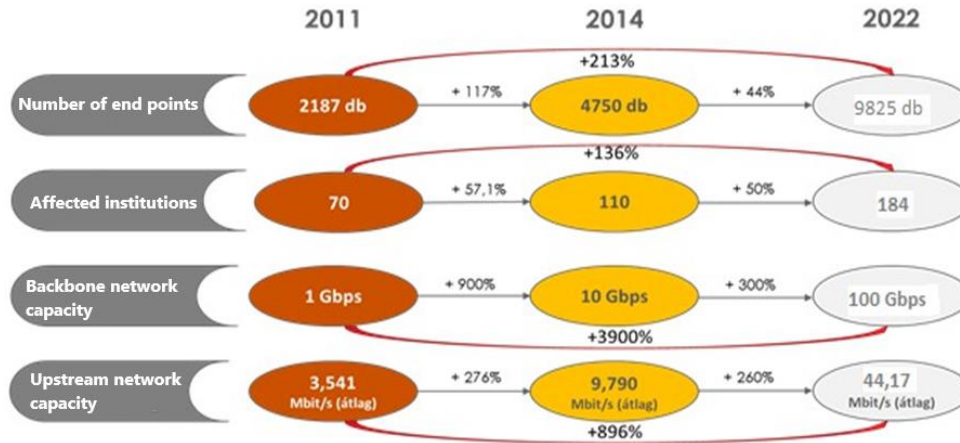
The backbone network managed and operated by the Government IT Development Agency (KIFÜ) is the **Digital Success Backbone Network (DJG)**. By extending the former HBONE and HBONE+ networks to the district centre level, DJG serves higher education, public education and research and development, as well as libraries, public collections and other public institutions.

DJG is comprised of the basic data network infrastructure provided to this group of institutions and the set of services necessary for the managed and secure operation of the network. DJG, funded by the state and maintained and developed by the Government Information Technology Development Agency, is thus a "basic utility" that provides a dynamically increasing internet bandwidth, basic infrastructure and layered services to the institutions designated in the legislation.

The physical layer of the DJG network consists primarily of a state-owned optical network, while the active elements (WDM and routers) are mostly composed of KIFÜ-owned equipment and are centrally managed by the KIFÜ.

DJG currently serves more than 6,000 educational institutions, 34 higher education campuses, around 40 research institutes, hundreds of public collections, and almost 1.2 million users in total on its core infrastructure of 79 backbone nodes, channelling more than 1,000 Gbps of data traffic.[34]

The ongoing development of the DJG and its backhaul network and the services provided on the network is being implemented by the **Student Network Programme**. The Student Network Programme is a programme aimed at developing the infrastructure and the portfolio of services to serve the high quality infocommunication needs of the Hungarian education sector (currently: public education and vocational training). The aim of the improvements being carried out under the programme is to ensure that public education and training institutions have symmetrical 100 Mbps with appropriate secure operation,

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[34] KIFÜ, 2019: Digital Infrastructure Development Strategy for Higher Education, Research Institutions and Public Collections

or 1 Gbps bandwidth, with adequate quality and service background, and WiFi coverage in educational areas and community spaces in the institutions specified, while ensuring both educational purpose and guest use. As part of the Student Network Programme, wired and wireless upgrades will be implemented in education and training institutions[35]. This development is ongoing, and bandwidth upgrades to serve school networks are being continuously implemented across the country. The most significant project supports the bandwidth upgrade of public education and vocational training institutions in the convergence regions by improving the backbone network and district access points and deploying WiFi systems. For 99.6% of the institutions, by the end of Q2, 2022, WiFi network deployments will be complete and sustainable high-speed networks (100 Mbps to 1 Gbps) will be available in more and more locations. Long-term management of the networks is the responsibility of the KIFÜ.

Overall, it can be concluded that technological progress has led to an ever increasing emphasis on digitalisation, both in the private sector and across a wide range of public and governmental sectors. In the case of the latter, it should be stressed that the development of ICT solutions in government and education systems is essential in today's world. The overall aim of these developments is typically to reform traditional systems that have become obsolete over time, thus introducing a new approach and a new methodology and requirements structure. A prerequisite for meeting these goals is the implementation and continuation of improvements in network access and connectivity of government and educational institutions. These efforts concern the development of both the National Telecommunications Backbone Network (NTG) and the access networks, which ultimately contribute to the consolidation of government networks, increasing their capacity and performance, and improving the wired and wireless connectivity and homogeneity of public education and training institutions.

Recent network developments will make it possible to create and develop a decentralised education and service platform that will ensure the availability of educational content in a cost-effective way, whilst maximising the ability to meet user needs. This could enable the system to achieve substantial infrastructure savings compared to the current underlying topology.

The pandemic and distance learning increased the importance of digital connectivity and digital presence, but these cannot be achieved without the appropriate infrastructure and tools. Students living in dormitories often have limited or no network access, yet the internet is essential for digital access to learning materials and for attending lessons. Central WiFi networks should be made available in the dormitories to ensure accessibility.

2.2.2.7 Supercomputing infrastructure in Hungary

One key to the success of scientific, theoretical and applied R&D activities is whether the supporting infrastructure has the necessary capacity. KIFÜ is responsible for the operation of supercomputers in Hungary. The total computing capacity of the national supercomputer (High Performance Computing, hereafter: HPC)

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[35] KIFÜ, Student Network Programme - Customer Information: https://kifu.gov.hu/projekt/koznevelesi-es-szakkepzesi- intezmenyek-vezetekes-es-vezetekes-nelkuli-halozli-halozli-fejlesztesii/, https://kifu.gov.hu/ugyfelszolgalat/diakhalo

currently operating in Hungary is 0.45[Pflops36], which is fully exploited by the 230 or so research teams using HPC in Hungarian research and education, but its capacity and capabilities are no longer sufficient to ensure the competitiveness of Hungarian researchers. Hungarian researchers are already compelled to make use of foreign capacities, e.g. within the frames of international programmes. Without dedicated HPC infrastructure, some research is impossible, and the HPC capacity required cannot be replaced by any other IT infrastructure. Internationally, the most powerful supercomputer currently available has a capacity nearly a thousand times of the Hungarian capacity.

In the future, in addition to HPC capacity increases, areas that stimulate the use of supercomputing capacities and related research should also be supported. Such support has the potential to generate direct benefits for the society, as well as helping researchers to optimise their time by allowing them to carry out their programming and execution activities more quickly. The use of supercomputers has a prominent role in key areas such as modern medicine, pharmaceutical research, weather forecasting, network research, experimental physics, cyber security, natural language and image processing, and other modelling, such as flow theory related modelling.

2.2.3. Digital competence

Starting from 2021, the DESI measures the digital skills of European citizens in only one dimension - human capital - as the component on internet usage patterns has been removed from the report.

Hungary ranks 23rd out of 27 EU Member States in terms of human capital, this down one place from last year, according to the latest DESI report (2022). Regarding the Hungarian data for this dimension, further concerted action is needed to achieve significant results in terms of training and employing female ICT professionals, as well as in increasing the number of individuals with basic software user skills.

DESI (in 2022) analyses the human capital dimension along a total of 7 indicators:

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[36] PFlops or PetaFlops

Flops is the unit of measurement of computing capacity of supercomputers. 1 Flop = 1 double precision elementary maths operation performed in 1 second. 1 Pflops, i.e. 10^{15} (one thousand billion) operations in one second.

Table 2: Hungary's situation according to the DESI human capital indicator (2022)

Human capital (25%)	DESI 2022 value 🇭🇺	DESI 2022 value 🇪🇺
DESI human capital dimension - components and their current value	**38.4**	**45.7**
1a1 At least basic digital skills (% individuals)	49.1%	53.9%
1a2 Above basic digital skills (% individuals)	21.5%	26.5%
1a3 At least basic digital content creation skills (% individuals)	59%	66%
1b1 ICT specialists (% individuals in employment)	3.9%	4.5%
1b2 Female ICT specialists (% ICT specialists)	14%	19.1%
1b3 Enterprises providing ICT training	16%	20%
1b4 ICT graduates (% graduates)	3.1%	3.9%

2.2.3.1 Human capital dimension

In terms of (digital) human capital indicators, Hungary ranks 23rd in 2022. Hungarian figures on this dimension have been below the EU average every year since 2016.

Figure 23: DESI human capital dimension Hungarian and EU average, from 2017 to 2022

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
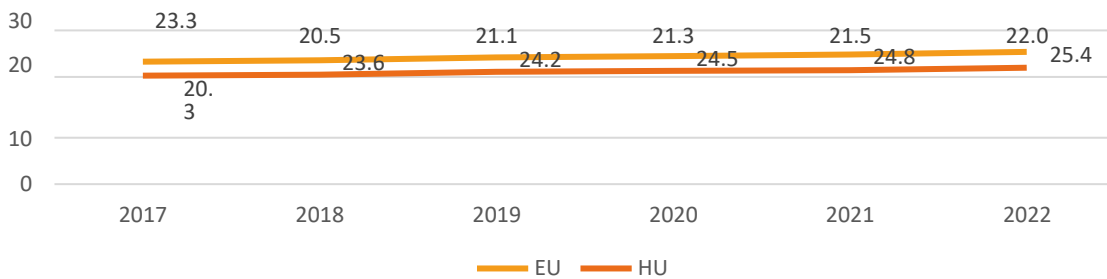
The share of individuals with at least basic digital skills is below the EU average, and this has been the case for every year reviewed since 2016. According to the survey, less than half (49.1%) of the Hungarian population covered have basic digital skills, compared to an EU average of around 53%.

Figure 24: Change in at least basic digital skills (Hungary and EU average, from 2016 to 2022, % of individuals aged 16-74)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
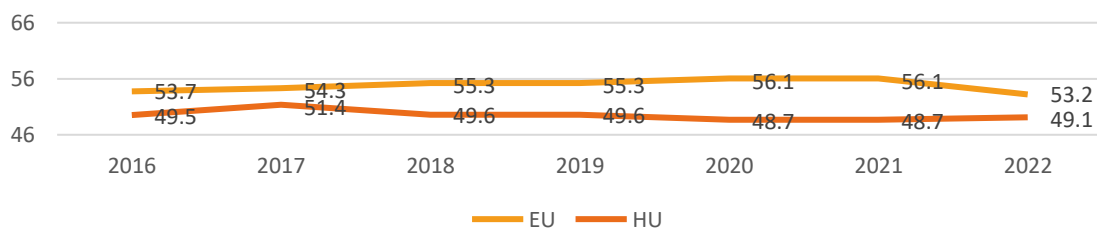
A further minor concern is that the proportion of **people with advanced digital skills** in Hungary is just above 21%, compared to the EU average of 26.5%.

Figure 25: Change in digital skills above basic (Hungary and EU average, from 2016 to 2022, % of individuals aged 16-74)
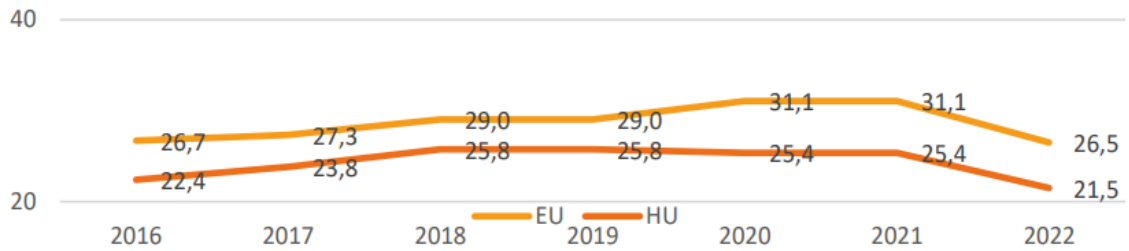
The **gap between Hungarian** and aggregate EU data as regards the **proportion of people with at least basic software skills** has also been evident for years. In 2022, the gap between Hungary and the EU is close to 5%, to the disadvantage of the former. The difference is striking even if we assume that the decline in Hungarian (and EU) data starting in 2020 is due to a methodological shift.

On a positive note, the Hungarian government is providing a free, open source software package (Digital Success Software Base Package) for Hungarian citizens to unlock the potential of digitalisation.

The uptake of open source applications and open standards in the public sector will continue to be a priority for the government. The aim was to produce a complete office software package that is fully capable of replacing the products having licensed versions.

Hungarian citizens who are visually impaired or reading-impaired, as well as their educational institutions, employing companies, service providers, professionals and family members, can apply for free licences of various screen reader and magnifying software within the frames of the Hungarian State's National Licence programme. Considerable emphasis is placed on promoting the principles of the Accessibility Directive in the development of public systems.

Over the last few years, a significant number of target groups have been reached through various training programmes, mainly with the help of EU funds. Under the priority project **GINOP-6.1.2-15**, nearly 260,000 people have obtained a certificate in digital literacy training for the general public[37].

Under the GINOP projects supporting corporate training, 138 large companies (**GINOP-6.1.5-17**) have provided ICT training, with a total of 6514 people receiving IT training. A total of 1,011 employees from 55 large companies participated in INDUSTRY 4.0 training and 13,374 employees from 657 SMEs (**GINOP-6.1.6-17**) received IT training.

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[37] Within the framework of the project, the DigComp Citizen Digital Competence Framework, which takes into account the recommendations of the DigComp 2.1 Reference Framework, was developed, as well as the professional concept and long-term operational model, organisational and institutional structure of the Digital Competence Framework, and the digital competence assessment and certification system.

A large company supported under the **GINOP-6.1.8-17** aimed at the creation of corporate training centres has trained 252 participants.[38] as regards INDUSTRY 4.0

In terms of **the proportion of ICT specialists**, Hungary exceeded the EU average until 2017, but since then Hungary's figures have consistently remained below the EU average, and the gap between the two opened further in 2020, but has not increased since then.

Figure 26: Change in the proportion of ICT specialists (Hungary and EU average, from 2016 to2022, % individuals in employment)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
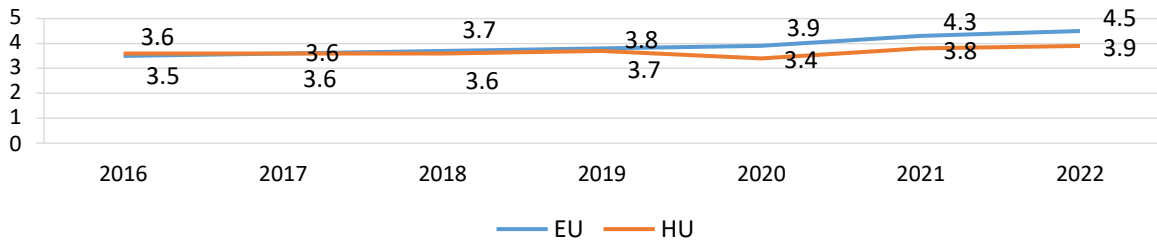
The indicator of the **proportion of ICT graduates** was the only indicator in this dimension where Hungarian figures exceeded the EU average: 4.9% of graduates graduated in ICT in 2021, but the figure fell below the EU average by 2022 (3.1%).

Figure 27: Proportion of ICT graduates (Hungary and EU average from 2016 to 2022, % of graduates)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations

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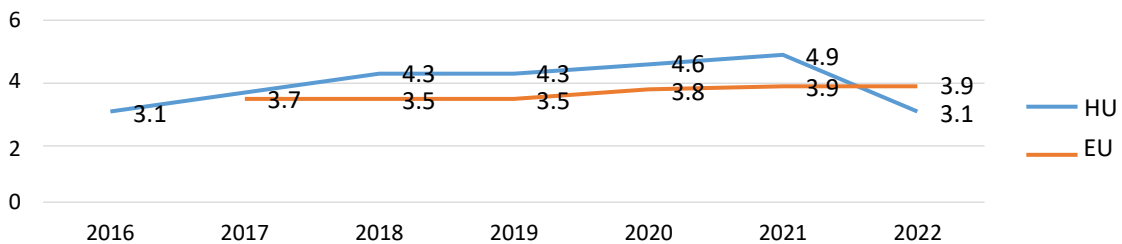
[38] The priority project **GINOP-6.2.5-VEKOP-19** contributes to the implementation of the objectives of the Digital Education Strategy (DOS) for vocational education and training and the implementation of the relevant tasks of the DOS Action Plan. Within the framework of the project, a programme curriculum for 175 professions, including the development of digital competences, was created, and the Digital Vocational and Adult Education Methodology Centre was established, offering support for the comprehensive, systemic digital transformation and development of vocational and adult education.

Under the priority project **GINOP-6.2.8-VEKOP-20**, 40 digital learning materials and manuscripts are planned to be prepared for the EU funding period 2021-2027. As part of the IT training for the Structural Change Support programme element of the project, 1,895 people participated in basic programming skills training with a pass rate of 97%, and 677 of those who passed obtained advanced level certificates in so-called advanced and production-specific training to further enhance their IT skills. Training courses for IT jobs in demand by businesses have been implemented, such as Frontend developer, Java enterprise backend developer, Junior fullstack API developer/tester, Junior automated tester, Database operator, System operator training.

2.2.3.2 Internet usage dimension (measured separately by DESI until 2020)

The internet usage dimension was part of the report as a separate pillar until 2020, however, it includes some indicators that complement the human capital indicators, so it is important to mention them. These indicators are included in the European Commission's Key Indicators. The Key Indicators present some key dimensions of the European information society.[39]

According to data of Key Indicators 2022, 9.9% of the Hungarian population have never used the internet, although this figure has improved by more than 46% compared to 2015. The gap compared to the EU average has not been closed in this period, but it is getting closer. In Hungary, nearly 1 million citizens in the age group measured by DESI were absent from the internet in 2021.

Figure 28: Change in the proportion of individuals who have never used the internet (Hungary and EU average, from 2015 to 2021, % of individuals aged 16-74)
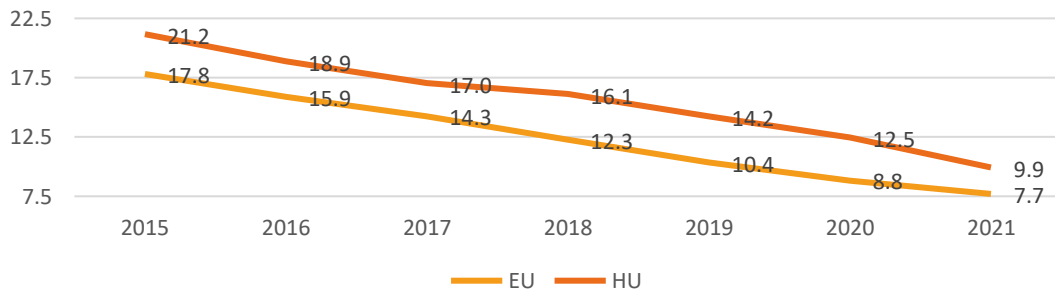
Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

The number of **people using the internet at least once a week** in Hungary has grown significantly in recent years and is now in line with the EU average.

Figure 29: Change in the proportion of individuals using the internet (Hungary and EU average, from 2015 to 2021, % of individuals aged 16-74)
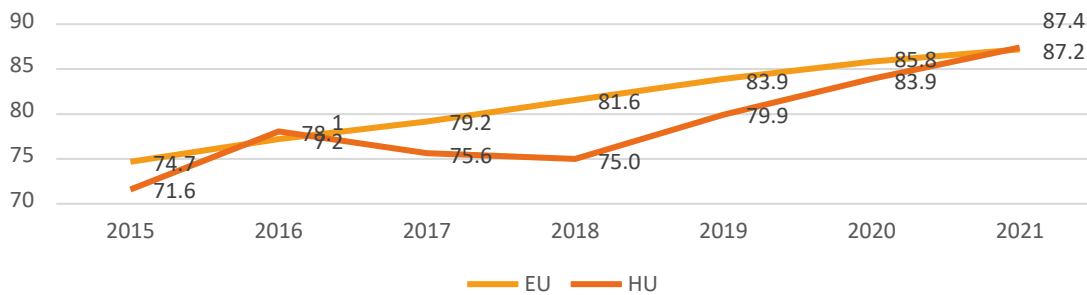
Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations
Note: the indicator includes those who use the internet at least once a week

In terms of internet usage, Hungary performs particularly well in the case of almost all services, with the only significant gap being in online video-on-demand.

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[39] Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators

Table 3: Internet usage (in the last 3 months, % of internet users)

Year	News		Music, video and games		Online video store		Video calls		Social networks		Doing an online course	
	EU	HU	EU	HU	EU	HU	EU	HU	EU	HU	EU	HU
2015	67.8	85.7	51.1	46.6	-	-	35.8	54.7	61.6	83.4	6.6	3.9
2016	70.3	88.1	77.8	80.8	18.4	7.7	37.6	53.6	61.4	82.8	6.9	4.7
2017	72.5	85.2	77.8	80.8	18.4	7.7	45.1	59.2	63.2	84.1	8.0	5.3
2018	72.5	85.2	79.4	82.4	27.5	11.0	48.8	59.5	64.1	85.9	8.0	5.3
2019	71.9	83.5	79.4	82.4	27.5	11.0	60.4	75.5	63.0	85.7	9.8	7.0
2020	74.8	82.8	81.4	89.2	39.8	30.5	71.5	80.1	65.3	87.3	15.0	14.6

Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

When it comes to the use of more sophisticated services that require a higher level of user knowledge, Hungary traditionally performs poorly in international comparison: despite significant growth in the last four years, less than two thirds of internet users in Hungary were using e-banking services at the time of the survey, which is 5 percentage points below the EU average.

Figure 30: Change in the proportion of people using electronic banking services (Hungary and EU average, from 2015 to 2020, % of internet users in the last 3 months)
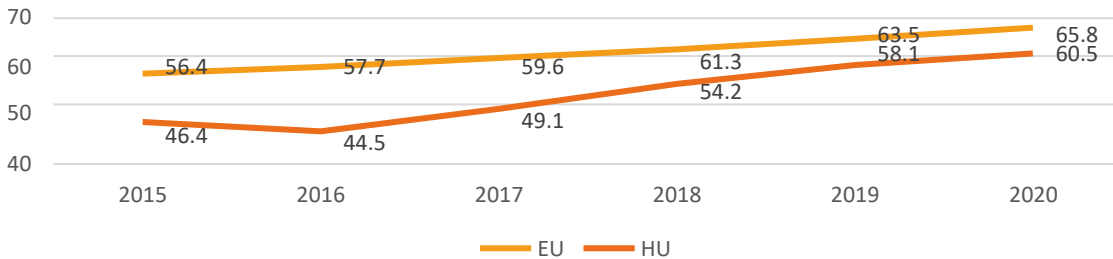
Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

The **proportion of online purchasers** is catching up considerably, but still falls short of the EU average, with a gap of 3 percentage points still present in 2020.

Figure 31: Change in the proportion of people making online purchases (Hungary and EU average, from 2015 to 2020, % of internet users in the last 12 months)
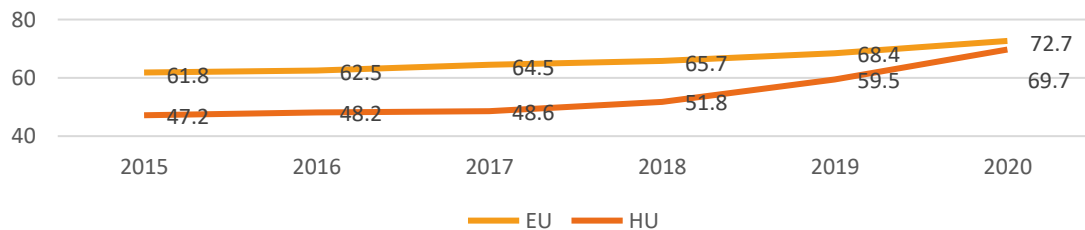
Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

Reacty Digital's representative research[40] in 2021 found that online purchaser preferred to shop online (57%) when given the choice between in-person, offline shopping and online shopping. By age group, 18-44 year olds prefer to order online (52%), while 2/3 of people aged 45-79 prefer to shop offline. 54% of the Hungarian population is trying to make environmentally responsible choices in all areas of life, to the extent possible. 38% of the population considers that ordering online is a (more) environmentally conscious way of shopping, yet less people choose to shop this way than in person (except for people aged 18-44 who prefer to make their purchases online).

By 2020, the proportion of the Hungarian **population selling online** was significantly higher than the EU average (33% compared to 22%).

Figure 32: Change in the proportion of people selling online (Hungary and EU average, from 2015 to 2020, % of internet users in the last 3 months)
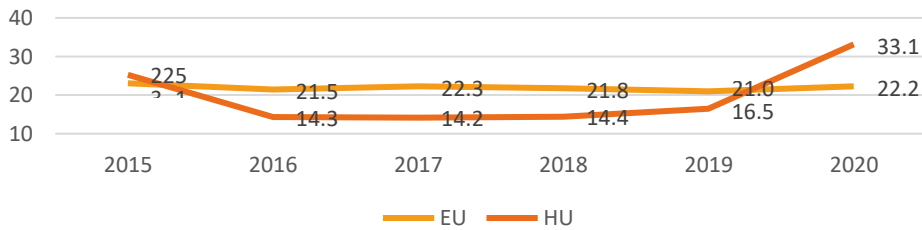
Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

The above image is reinforced and further detailed by a study conducted by the NMHH in 2021[41], showing the trends of Internet usage (at home) among the population aged 16+, broken down by age groups. The study clearly shows that the use of social networks and browsing tend to dominate, and, to a lesser extent, online shopping or online administration.

Figure 33: Average proportion of time spent on a given activity by each generation

Source: NMHH

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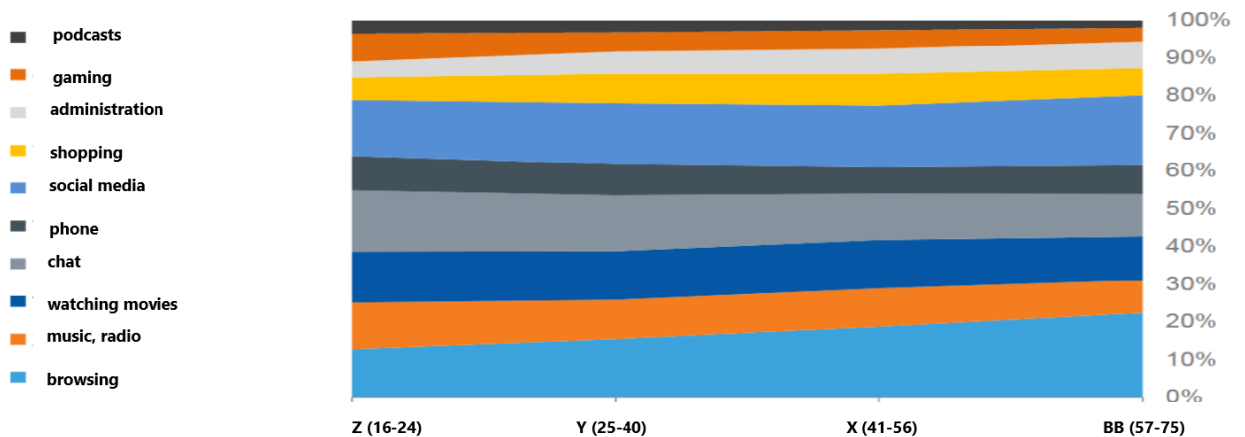
[40] Source: https://reacty.digital/zold-e-kereskedelem-mit-gondolnak-a-vasarlok
[41] Source: Consumer survey of the electronic communications market, 2021, NMHH 2021, source: https://nmhh.hu/dokumentum/227957/nmhh_haztartasi_felmeres_2021_riport.pdf

During the COVID-19 pandemic, the NMHH also carried out an empirical survey[42] on media usage and news consumption habits of the population during the pandemic. Although the research looked at the use of simpler services (excluding those requiring more sophisticated skills), the report concludes that *"The biggest changes are in the use of the internet. This is partly linked to the rise of remote working and the shift in the education system towards distance learning, but the transformation has been more complex. Practically all relevant internet activities and consumption of online media content have become more common and more massive during the epidemic."* When translated into numbers, it means that the use of the services concerned (in particular information search and communication channels) has increased, more or less, but in all cases.

Although the survey did not cover higher value-added services, it can be implicitly assumed that the epidemic has had a positive impact on the uptake of e-government, e-banking and e-commerce services.

This hypothesis is reinforced - especially as regards e-commerce services - by Reacty Digital's research in March 2020[43] which found that
- the online shopping habits of 40% of people aged 18-79 were affected by the pandemic;
- the majority of them planned to order online at least as often or more often and in the same or greater quantities during the surveyed period than before the epidemic;
- more than one tenth of the respondents said in March 2020 that, although they had not previously planned to do so, they would order household cleaning products (drugstore, household items) online, and one tenth would buy health-related products online;
- one fifth of the respondents had not previously considered buying groceries online, but in the wake of the pandemic were after all likely to use this sourcing channel (a further 18% had planned to do so);
- 13% of people aged 18-79 were planning to try ordering takeaway meals online for the first time in their lives (previously 31% of adult internet users had ordered a hot meal online);
- in the case of online shopping, half of the respondents would only order from an online shop where cashless payment is possible, while for a third of them this aspect was not relevant.

2.2.3.3 Availability of ICT specialists

Higher skilled ICT specialists are one of the key building blocks of digitalisation. In Hungary, these workers accounted for 3.9% of total employment in 2021, slightly below the EU average (4.5%). Although this puts Hungary ahead of Spain, Italy and Poland, among others, virtually all European countries lag far behind the United States and the Far East in terms of this indicator.

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[42] Media use and news consumption habits of the population during the first phase of the coronavirus epidemic, NMHH, 9 July 2020, source:
http://nmhh.hu/dokumentum/213415/NMHH_PSYMA_COVID_JELENTES_fin.pdf, downloaded: 16/08/2020
[43] The research was carried out at the time of the pandemic, between 24 March and 7 April 2020, using an online questionnaire based survey of people aged 18-79. Source: https://reacty.digital/tobbet-es-tobbszor-order-online/

Figure 34: ICT specialists in proportion of total employment by EU Member State, 2021
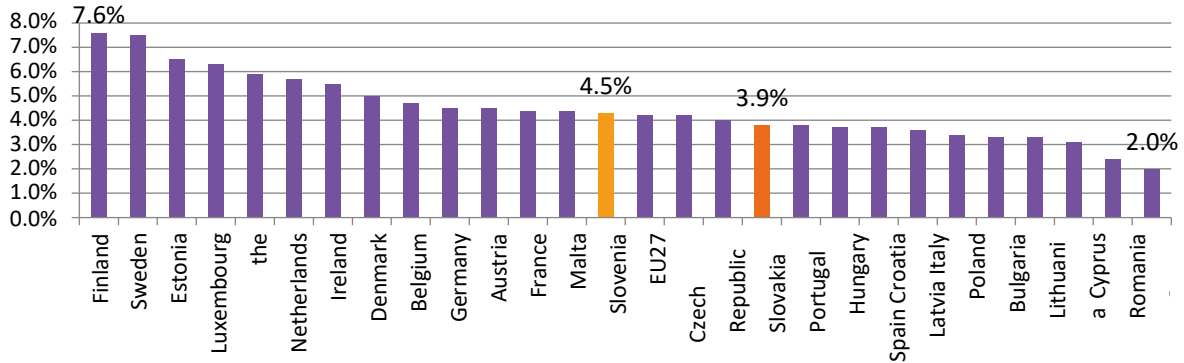
Source: Eurostat, 2020, Employed ICT specialists
https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_sks_itspt&lang=en

Probably one of the most important (human) factors hindering the progress of digitalisation in Hungary is the lack of ICT specialists. This inhibits the growth of the ICT sector, jeopardises the improvement of economic competitiveness and the proper (timely and quality) implementation of the necessary digitalisation developments (not only in the for-profit but also in the non-profit/public sector). Analyses indicate not only a quantitative labour shortage, but also quality problems in the IT labour market, one of the main reasons being the insufficient number of people entering and graduating from IT courses in higher education (in most advanced economies this rate reaches up to 10% of all university graduates)[44].

Percentage of BSc graduates in higher education in computer science	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
	6.10%	6.48%	6.98%	7.55%	4.94%[45]

Several EU-funded programmes (e.g. the project Program Your Future[46]) and other government measures (e.g. dual higher education, introduction of a new scholarship scheme) are aiming to solve the problem, but additional steps may also be necessary.

2.2.3.4 Digital competence in education

In Hungary, one fifth of primary school students studies in a digitally well-equipped school, this proportion is higher in secondary schools, but is below the European average at all levels, according to a survey of students carried out by Deloitte and Ipsos for the European Commission[47]. In the research, schools were considered digitally well-equipped if students had access to desktop computers, laptops, digital cameras or video cameras, interactive whiteboards, see Figure 35:Percentage of students in educational institutions by digital equipment level of the institution in the 2017-18 academic year.

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[44] Source: Department of Education database: https://dari.oktatas.hu/firstat.index?fir_stat_ev=2020

[45] This year, due to the abolition of the language examination requirement for graduation, the number of graduates in non-IT fields of higher education was much higher than in previous years, so this figure is much lower than in previous years

[46] https://programozdajovod.hu

[47] Source: European Commission, 2019, 2nd Survey of Schools: ICT in Education https://ec.europa.eu/digital- single-market/en/news/2nd-survey-schools-ict-education

Figure 35: Percentage of students in educational institutions by digital equipment level of the institution for the academic year 2017-18
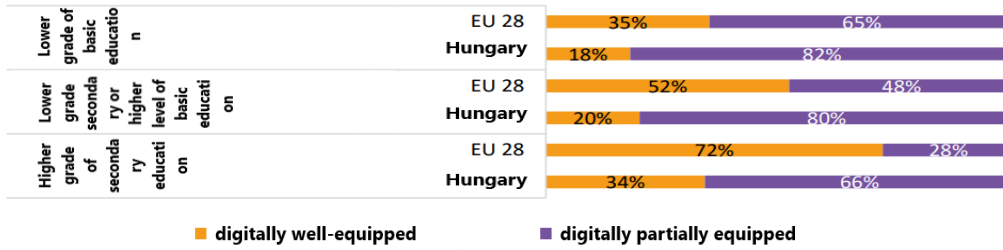
Source: European Commission, 2019, 2nd Survey of Schools: ICT in Education https://ec.europa.eu/digital-single- market/en/news/2nd-survey-schools-ict-education

The proportion of classrooms with internet access doubled between 2007 and 2018. The highest proportion of internet access was found in vocational secondary schools (rising steadily from 47% to over 90% by 2018), and around 70% of classrooms in vocational schools also had internet access by this time. In the case of primary schools, the capital had the highest proportion of primary school classrooms with internet access from 2007 to 2010, and from 2011 onwards this proportion grew higher in other types of municipalities.

The uptake of interactive whiteboards has increased significantly since 2007, but especially after 2010. While only 5-10% of schools had interactive whiteboards at the beginning of the period, by 2018, 40-50% possessed this tool. In particular, it was the primary schools where provision improved: Between 2010 and 2011, the percentage of classrooms with interactive whiteboards increased by almost 30 percent. This significant expansion is mainly due to the campaign to supply of interactive whiteboards to schools in rural, urban and metropolitan areas, while in Budapest the supply of interactive whiteboards has been continuous.

According to a survey by Deloitte and Ipsos, 75% of Hungarian upper primary school students use a desktop or laptop computer at school on a weekly basis, which is well above the EU average (52%). However, this advantage no longer holds at secondary school level, with 51% of students in secondary education, significantly below the European average (59%). On average, around one tenth of students in upper primary education in the EU Member States use their own tablet or laptop at least once a week in class. In Hungary, this is less common among upper primary school students, but the 25% share of smart phone use for learning purposes at school is already close to the EU average (30%). 7% of Hungarian students in upper secondary education use their own tablet, 9% use their own laptop in class and 58% of students use their own smart phone, this being above the European average.

The equipment and digitalisation of vocational schools is not always sufficient to provide the appropriate quality of education. Developing these institutions is essential to ensure the readiness of students in vocational education and training. In terms of vocational education and training and higher education, 73,000 persons in Hungary had an ICT qualification among those employed in 2021: 35.6% were educated in vocational education and 64.4% in higher education.[48]

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[48] Source: Eurostat, 2018, Employed persons with ICT educational attainment level https://appssocation by educational attainment level https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ski_itedu&lang=en

The COVID 19 pandemic has further reinforced the idea that digitalisation is key to the education dimension. Improving the digital learning space, content and services is a priority to ensure that institutions can cope even with exceptional circumstances such as a pandemic. With the introduction of distance learning, digital space has taken on an even more prominent role than before, as the need for maintaining closer contact between different actors (teachers, students, parents), digital accessibility of teaching materials and at the same time modernisation has intensified. In conjunction with this, the use of tools to accelerate the digitalisation of learning materials and new technologies such as artificial intelligence and VR solutions to improve individuals' learning processes can result in an outcome that is more effective.

However, the need for development is not limited to the curricula and the digital environment. Today, educational institutions still carry out many administrative tasks on paper, this is inefficient and often makes traceability difficult. It would therefore be necessary to move the entire education system and the administrative work processes of the institutions into the digital space. Furthermore, at present, there is no single register for data management that would include in one place the qualifications of graduates from the school system. Such a register would contribute to a more efficient functioning of the whole education system, reducing administrative burdens and supporting policy-making. The storage of educational information, qualification data and results in a database would be a data asset that would not only bring benefits at the system level, but also for the students in public education. Based on the data in the register, students would have a clearer picture of their skills and competences, and knowing this could support them in making decisions about their future.

The digitalisation of education and the digital development and support of educational institutions' processes help to reduce and balance the workload of teachers and staff, while simplifying some of the tasks that parents have to carry out. One of the most important tasks before the start of the school cycle is to determine the teaching pattern, the planning and scheduling of which is currently mainly done manually. Incorporating classroom and equipment requirements, as well as the needs of teachers and students, into a digital support system would allow the institution to create the most optimal teaching timetable possible. Increasing the efficiency of the organisational process can free up human and material resources, and the greater compatibility of individual needs can have a positive impact on the activities of workers who work part-time or in several institutions at the same time.

Digital technologies can simplify the planning process not only in the field of education, but also in other areas of institutional activity such as organising catering. In addition to reducing the burden of the relevant compulsory administration, as a means of accounting for the payment of costs, IT support provided with the service can also be used to assess and meet individual needs (e.g.: providing online payment for parents, individual filling in of children's school meal days).

2.2.4. Digital economy

2.2.4.1 Digitalisation in business operations

As in all areas of life, the use of digital technologies is becoming more and more natural also for the operation of businesses. In this process, the non-technology-intensive and

non-manufacturing businesses are also affected, because business and consumer habits and needs have drastically changed with digitalisation, and there is no way to escape its impact. "Creatively disruptive" technologies are becoming increasingly prevalent around the world, where new methods and business models disrupt or even radically transform existing ways of doing things, impacting the business value of products and services.

The **vast majority of Hungarian companies are not prepared** for the changes that would transform the entire production or service process, product development, supply and supplier chains, and this could fundamentally destabilise their competitiveness within 3-5 years. Inadequately managed processes can reduce operational efficiency in many areas, and can also make generational change more difficult. Meanwhile, investment in modern technologies across the EU will lead to huge changes in expectations towards SMEs.

A comparative survey by the European Union shows that the **use of digital technologies by SMEs in Hungary is more limited** than in other economies, despite the growing need for it in order to be competitive, and the increasing public expectations and relevant regulations that are being put in place, having a positive impact not only on increasing digitalisation but also on reducing the black and grey economy. Examples of such **good practices include** the obligation to use the **Company Gate (Cégkapu)** for tax communication; the obligation to report invoices issued through the **Online Invoice System**; the full digitalisation of tendering processes, etc. The expansion of these public digital tools can further improve the situation.

The coronavirus crisis has put (also) **Hungarian businesses** in a **new situation**, with the role of digital solutions, such as the shift to mass remote working or online sales and delivery, continuing to grow. This seems to have been recognised by an increasing number of economic operators, who have taken steps to develop in this area.

In Hungary, grants have been available from EU economic development operational programmes for improving the ICT situation of businesses and introducing business ICT systems and tools since the early 2000s. Since 2015, in addition to these schemes, and linked to them, companies (at least in rural areas) have also been provided with non-financial, free professional expert support from the government and the Chamber of Commerce (GINOP 3.2.1 - Modern Entrepreneurship Programme[49], MVP). MVP is a large-scale nation-wide programme, having reached more than 20,000 SMEs by the end of 2021, of which more than 15,000 have already received consultancy services, and the linked GINOP proposals have helped thousands of businesses, but there is still a large number of people who are not targeted. It is a shortcoming that micro-enterprises have not been able to benefit adequately so far from these government programmes, and the Central Hungary region is typically unable to participate in good development policy opportunities due to a lack of resources.

Over the last twenty years, the computing capacity of computers has been growing almost exponentially, and we have now reached a point where many rule-based and repetitive tasks can be automated. This development has led to the birth of Robotic Process Automation (RPA), which is expected to become one of the drivers of innovation in corporate back office processes. Companies are increasingly focusing on process improvement and the ability to flexibly scale up or down production, resulting in a steadily growing demand

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[49] Source: https://vallalkozzdigitalisan.hu/

for technology-based innovation. RPA can also help to achieve significant cost savings in the case of already standardised processes with short commissioning times, offering an excellent opportunity for value creation[50].

The global market for production process management support software is expected to grow steadily at an average annual rate of around 12% between 2021 and 2026[51]. Market expansion is being supported by a growing level of investment in production efficiency solutions. Such technologies include INDUSTRY 4.0 and various IoT enterprise systems. At present, offline or field-deployed systems make up the largest share of the industrial scheduling software market, but analysts predict a higher growth potential in cloud-based, online systems. The market is driven by the need to improve the efficiency of production processes. An increasing number of Hungarian companies are using digital tools in production management, and INDUSTRY 4.0 solutions are becoming more and more integrated into the production practices of Hungarian manufacturing companies, but there is still room for improvement in the Hungarian industrial sector.

DESI (in 2022) analysed the digital inclusion dimension along a total of 11 indicators:

Table 4: Hungary's position based on the DESI indicator Integration of digital technology in businesses

Integration of digital technology (in businesses) (25%)	DESI 2022 value	DESI 2022 value
DESI Integration of digital technologies in businesses - components and their current value	*21.6*	*36.1*
3.a.1 SMEs with at least a basic level of digital intensity % SMEs	34.5%	54.9%
3.b.1 Electronic information sharing (% enterprises)	20.9%	38.1%
3.b.2 Use of social media (% enterprises)	13%	29%
3.b.3 Use of Big data (% enterprises)	7%	14%
3.b.4 Use of cloud services (% enterprises)	20.6%	34%
3.b.5 Use of AI-based solutions (% enterprises)	3%	8%
3.b.6 ICT for environmental sustainability (% enterprises having medium/high intensity of green action through ICT)	65%	66%
3.b.7 e-invoices (% enterprises)	13%	32%
3.c.1 SMEs selling online (% SMEs)	18%	18%
3.c.2 e-commerce turnover (% SME turnover)	11%	12%
3.c.3 Selling online cross-border (% SMEs)	7%	9%

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[50] Source: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/process-and-operations/us-sdt- rpa-pov.pdf
[51] Source: https://www.technavio.com/report/global-manufacturing-operations-management-mom-software-market-industry-analysis?tnplus

According to the DESI 2022 report, Hungary ranks 25th among EU Member States in **terms of the integration of digital (enterprise) technologies**. For now, Hungary is the worst performer in the enterprise segment, but has achieved results close to the EU average in e-commerce revenue and cross-border online sales. Hungary scored highest in ICT for environmental sustainability, only 1 percentage point behind the EU average.

Figure 36: Average data for Hungary and the EU concerning the DESI digital technology integration dimension, from 2017 to 2022

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
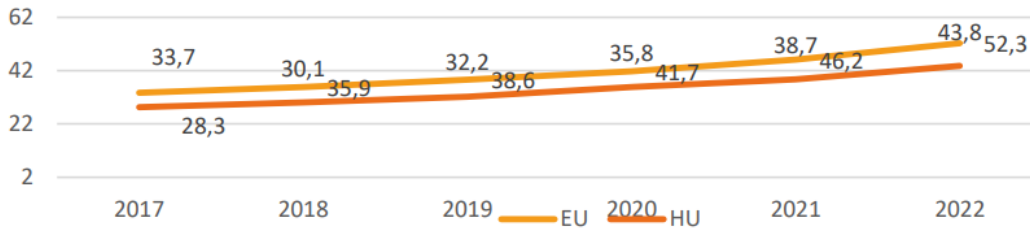
With 21% of enterprises **using** an ERP system, Hungary is 17 percentage points behind the EU average (38%), where one in three relevant enterprises use an ERP system offering some functionality. The gap has now closed somewhat, but it is still significant.

Figure 37: Change in the proportion of enterprises using an internal management system (Hungary and EU average, from 2016 to 2022, % of enterprises with more than 10 employees, except the financial sector)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
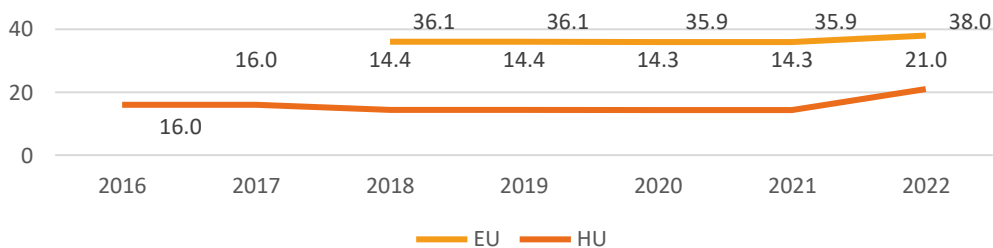
The Hungarian figures for **social media platforms** used by businesses are also much lower than the EU average. The proportion of businesses using at least two different social media platforms, blogs, microblogs, wikis, etc., and having user profiles on these platforms, as alternatives to information-only and non-transactional business websites, is less than 13%, compared to 29% in the EU.

Figure 38: Change in the proportion of enterprises using social media platforms (Hungary and EU average, from 2016 to 2022, % of enterprises with more than 10 employees, except the financial sector)
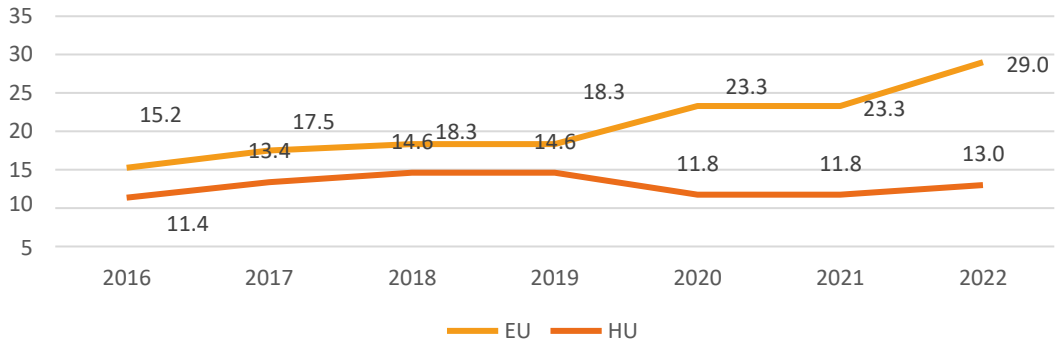
The share of **businesses** in Hungary that **process and analyse large data sets** from any source ('internal' and 'external') (7%) is half the EU average (14.2%). Even if the declining trend in Hungarian data is presumably due to methodological problems in data provision and/or data processing, the difference is quite significant. This backlog is particularly problematic because **the proper use of external and internal business data** is now increasingly a key issue for businesses. The Hungarian government has started to address the issue by adopting the **Artificial Intelligence Strategy** and its measures, and by preparing and establishing the legal and organisational framework for the **exploitation of data assets** (see National Data Asset Agency). The 2021 report shows an improvement of 0.8 percentage points compared to the previous year.

Figure 39: Change in the proportion of enterprises analysing large data sets (Hungary and EU average, from 2016 to 2021, % of enterprises with more than 10 employees, except the financial sector)
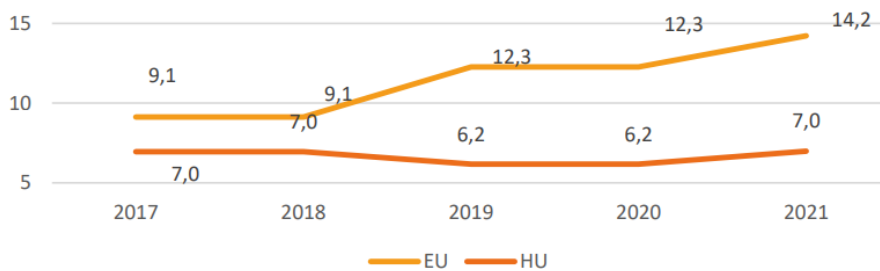
There is also a significant lag in the proportion of **businesses using cloud-based services**: in Hungary, practically one in six businesses (covered by the survey) use cloud-based services (email, office software, database, files, financial, accounting software, CRM systems, etc.), and this figure has increased a lot over the past year, presumably due to the pandemic (also in the EU).

Figure 40: Change in the proportion of businesses using cloud services (Hungary and EU average, from 2016 to 2022, %of enterprises with more than 10 employees, excluding the financial sector)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
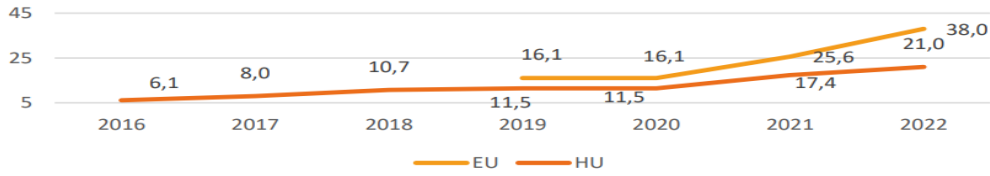
The number of **Hungarian businesses selling online** has increased by one third compared to 2016, bringing it up to the EU average.

Figure 41: Change in the proportion of small and medium-sized enterprises selling online (Hungary and EU average, from 2016 to 2022, % of enterprises with 10-249 employees, excluding the financial sector)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
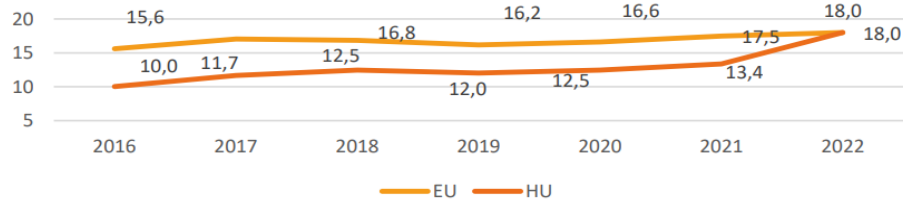
The proportion of **e-commerce revenues generated by Hungarian SMEs** (11%) was below the EU average (12%) once again, but by a smaller margin, and the two figures were almost identical last year, so we are not lagging behind badly in terms of this indicator.

Figure 42: Change in e-commerce revenue for SMEs (Hungary and EU average, from 2016 to 2022, % of enterprises with 10-249 employees, excluding the financial sector)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
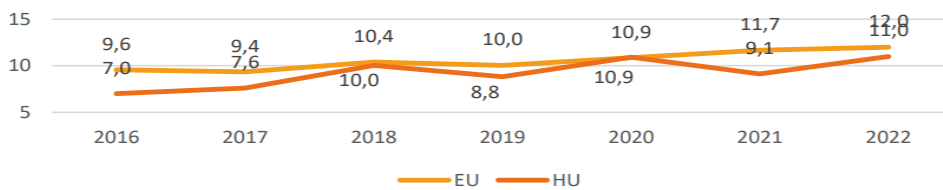
These unfavourable figures would be even worse if micro-enterprises were also included in the DESI indicators[52].

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[52] Századvég carried out an analysis for the Ministry of Finance on the digital development of micro-enterprises (internal working paper).

2.2.4.2 ICT sector and digitalisation-related R&D&I

A common characteristic of businesses active in the ICT sector is that they are not users of digitalisation at the first place, but rather the purpose of their activities is related to it. Just as the availability of physical infrastructure is a prerequisite for digitalisation, so are the presence and stability of ICT service and solution providers.

The ICT sector, which lies at the heart of the digital economy, is becoming increasingly important within the national economy as digitalisation advances. The economic and social role of the sector and its importance have already been described in section 1.3, there are some major factors where public intervention may be necessary:

It is a problem that the ICT sector is largely concentrated in the Central-Hungarian region, typically in Budapest. This is obviously due to the characteristics (e.g. availability of labour), but in the medium term this concentration should be reduced.

The role of start-ups is important in the sector, and in addition to the success stories ("Hungarian ICT start-ups with digital products and services that are commercially viable also abroad"), there are also several shortcomings (regulatory gaps, complex support policies that ignore the fundamental characteristics of the segment), while the employment, innovation and export potential of domestic ICT start-ups can be considered high, and the programmes launched so far (e.g. INPUT[53]) and government action need to be followed up by further state action.

In some of the more important segments of the sector, such as hardware manufacturing in particular, there are few Hungarian companies with a smaller presence, which means that we are almost entirely dependent on imports for some ICT products and devices.

In the context of the digital economy, the ICT sector and businesses, its developer and service provider side, the R&D&I performance is particularly important. We cannot emphasise enough the role of innovation in economic growth and improving labour productivity.

Innovation performance is measured by the European Innovation Scoreboard (hereafter referred to as the EIS), set up annually by the European Commission, and serving as a relevant benchmark for Hungarian innovation policy. The scoreboard provides a picture of national innovation systems along different dimensions, mainly in relation to human resources, economic indicators and financial expenses. The 2021 report places Hungary in the top half of the "emerging innovators" group. Hungary scored best in the dimensions of sales impact, digitalisation and relationships. The top 3 indicators are government support for business R&D, foreign PhD students, and medium and high-tech exports of goods. According to the report, Hungary has an above average share of non-innovators with innovation potential and scored below average on climate change indicators. [54]

The majority of Hungarian-owned businesses are small or medium-sized enterprises.
For Hungarian SMEs, the proportion of enterprises innovating both in products and processes, and in marketing and

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[53] Source: https://inputprogram.com/
[54] Source: https://ec.europa.eu/docsroom/documents/46013/attachments/1/translations/en/renditions/native

organisational innovation, as well as "in-house" innovation, is low. According to the latest (2018-2020) data of the Community Innovation Survey (CIS) conducted by the Hungarian Central Statistical Office (KSH), only 30% of firms with 10 to 49 employees and 43.7% of firms with 50 to 249 employees are considered to be innovative. These rates are more favourable in the ICT sector, exceeding 50% in all segments. [55]

The breakdown of R&D expenditure by sector clearly shows that, in line with international trends, the "Information and communication" (infocommunications) sector is of particular importance also in Hungary, accounting for 8.7% of total R&D expenditure in 2019, with business services and community services also contributing to this sector, which would also be relevant for the digital economy.

In the context of the R&D&I performance of a sector or area, it is important to examine to what extent such projects are supported by the public tendering system. The picture is rather ambiguous. One of the policy features of the use of RDI grants is that calls for proposals do not usually include sectoral preferences, not even ICT. In the majority of calls for proposals, ICT-related or thematic development could be the subject of a targeted R&D&I project, and R&D&I development could be carried out by any company in the ICT sector from the support.

In the case of grants allocated from EU funds, the picture is nuanced by the fact that ICT-related R&D&I projects were not favoured for most of the 2014-2020 cycle, and ICT sector businesses and ICT-related developments did not do very well in the calls for proposals, with the exception of the lower-budget VEKOP (Competitive Central Hungary Operational Programme) proposals. Reasons for this ranged from the interpretability of the innovation content, the difficulty to compare it with other topics, evaluation anomalies due to these and other factors (e.g. human factors), to the inadequate preparation of the applicants.

Table 5: ICT-related projects within the winning GINOP-VEKOP R&D projects

	R&D&I projects awarded in 2017-2019			ICT projects		
	Sponsored projects	Aid granted (billion HUF)	Awarded total cost (billion HUF)	Sponsored projects pcs (%)	Aid granted (billion HUF)	Awarded total cost (billion HUF)
GINOP	3,804	218.85	376.76	238 (6.26%)	32.53	49.62
VEKOP	314	42.4	65.79	72 (22.92%)	7.34	13.36

Source: EUPR/MSTR query 18/03/2020

In the next period, special attention should be paid to digitalisation and ICT R&D&I projects, as various economic crises can only be effectively addressed with high-quality IT developments and solutions, and the ICT sector is the foundation of the digital economy, but in Hungary it is still lagging far behind the EU average. In order to address this, it is necessary to support national ICT companies and the R&D activities of non-ICT companies in the ICT field.

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[55] Source: https://www.ksh.hu/stadat_files/tte/hu/tte0018.html

2.2.5. Digital State

DESI (in 2022) analyses **digital public services** dimension along a total of 5 indicators:

Table 6: Hungary's position based on the DESI Digital Public Services Indicator (2022 report)

Digital public services (25%)	DESI 2022 value 🇭🇺	DESI 2022 value 🇪🇺
DESI Digital public services dimension - components and their current value	*57.4*	*67.3*
4a1 e-Government users (% internet users)	81%	65%
4a2 Pre-filled forms (0 to 100)	60	64
4a3 Digital public services for citizens (0 to 100)	64	75
4a4 Digital public services for businesses (0 to 100)	74	82
4a5 Open data (% maximum score)	58%	81%

Hungary is ranked 21st in **digital public services**, up four places from last year. Compared to 2016, Hungarian figures in this dimension have increased significantly, but this increase was enough only to track the EU average, without reducing the gap.

Figure 43: Hungarian and EU average data for the DESI digital public services dimension, from 2017 to 2022

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
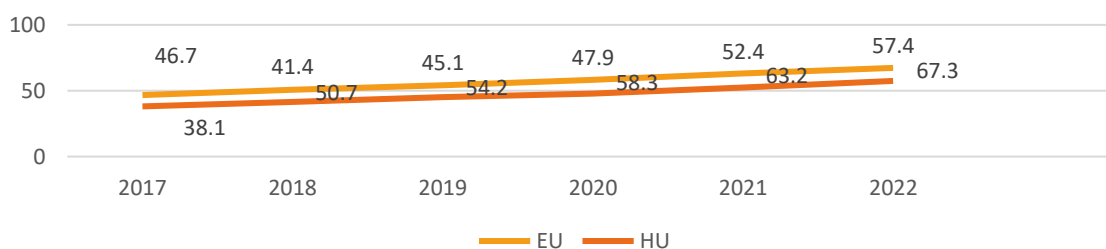
The rate of growth in the number of **internet users using eGovernment services**[56] is similar at the Hungarian and EU level, but the Hungarian growth edge in this area has been further increased, probably in large part due to the COVID-19 epidemic, and the methodology for measuring the indicator has also been changed to the advantage of the Hungarian initiative, as it no longer considers only the submission of forms to public administrations as a use of online public services. According to the latest figures, 70% of internet users in Hungary used eGovernment services in the last 12 months, compared to around two thirds in the EU. Hungary is therefore ahead of the

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[56] It should be noted that in November 2021, the number of live gateway registrations exceeded 5 million.

average of the Member States, and is currently 11 places ahead of the 2021 DESI results, ranking 9th in the European Union.

Figure 44: Change in the proportion of people using eGovernment services (Hungary and EU average, from 2016 to 2022, % of internet users)

Source: https://digital-agenda-data.eu/datasets/desi/visualizations
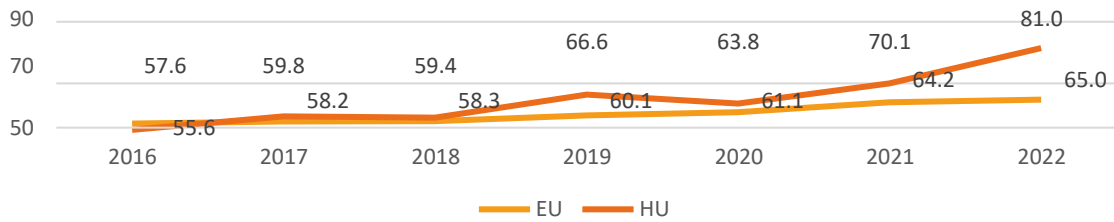
In Hungary, the largest increase in this dimension is in the proportion of **pre-filled forms**. This indicator measures the re-utilisation of data between public administrations to facilitate citizens' lives, thanks to the introduction of the service bus (Central Government Service Bus - KKSZB), which automates data communication between public administrations under the professional supervision of the Ministry of Interior, and the automatic pre-filling of data in new online forms and services. Hungary is close to the EU average in this indicator in 2021. Although the indicator is available in the DESI 2022 report, the annual change in proportions is available in the Key Indicators data, so the data in Figure 45 is taken from there.

Figure 45: Pre-filled forms (0 to 100, Hungary and EU average, from 2015 to 2021)
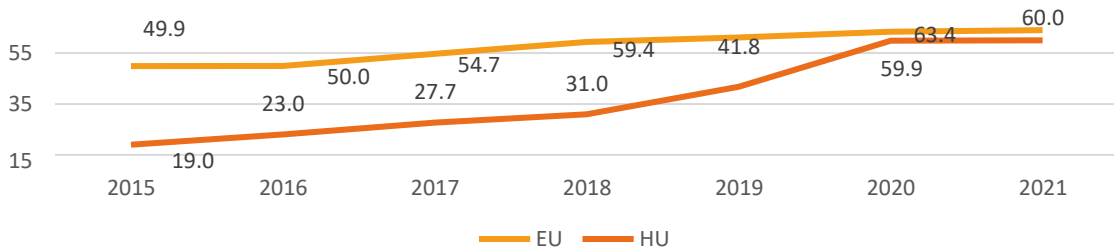
Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/visualizations

The indicator for **full online administration** (which refers to the online administration of all aspects of an administrative case[57]) increased by 5 percentage points (compared to 2 percentage points in the EU) in 2021 compared to the previous year, further closing the gap between Hungarian and EU figures[58]. The indicator is not included in the DESI 2022 report, so the source of the proportions shown in Figure 46 is Key Indicators.

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[57] In relation to the following life situations examined by the eGovernment Benchmark: Starting a business, looking for a job, continuing studies, normal entrepreneurial activities, moving house, car ownership, driving related matters, small-value claims.

[58] Based on the inquiry of the Ministry of Interior in November 2019, according to the bodies that responded to the online survey regarding their e-administration practices, 76.9% of cases initiated electronically and received through the online channel are processed electronically, but some procedural steps or the whole process is handled also on paper, while 17.3% of cases are processed internally on paper only.

Figure 46: Full online administration (0 to 100, Hungary and EU average, from 2014 to 2019)
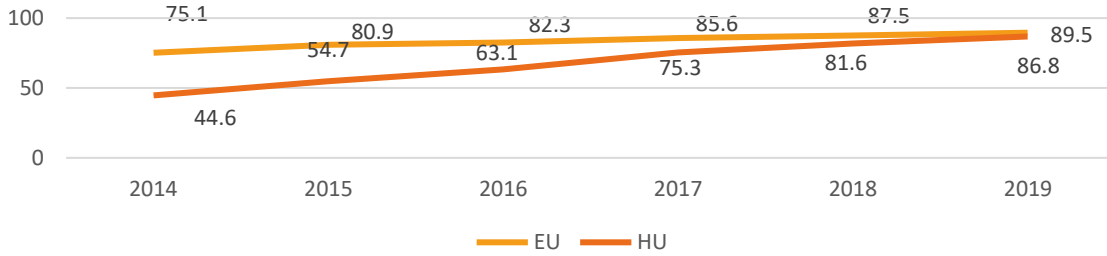
In the 2021 DESI report, this indicator has been replaced by a new indicator, **Digital public services for Citizens**. The gap between Hungary and the EU average (64 vs. 75) is more significant for this figure, measured for the first time in 2020. This is due to the fact that, in line with the latest EU policy objectives, the new indicator now takes into account the existence of cross-border services with a weighting that is essentially the same as that of domestic services, which have not been given sufficient weight in the case of Hungary.

The scores **for digital public services for businesses[59]** are also below the EU average, but the gap between EU and Hungarian figures has been steadily narrowing until 2019. As a result of the recent change in methodology, now even this indicator takes into account the existence of cross-border services with greater weight, which is the reason for the drop in the score for 2020. Moreover, the weight of the indicators on digital public services provided for citizens and businesses has doubled within the dimension compared to the other indicators under the new methodology, which is also the reason for the lack of improvement in the overall result. Due to the change in methodology, a time-series comparison is not available on the DESI official site, but is available on the Key Indicators site.

Figure 47: Digital public services provided for businesses (0 to 100, Hungary and EU average, from 2015 to 2021)
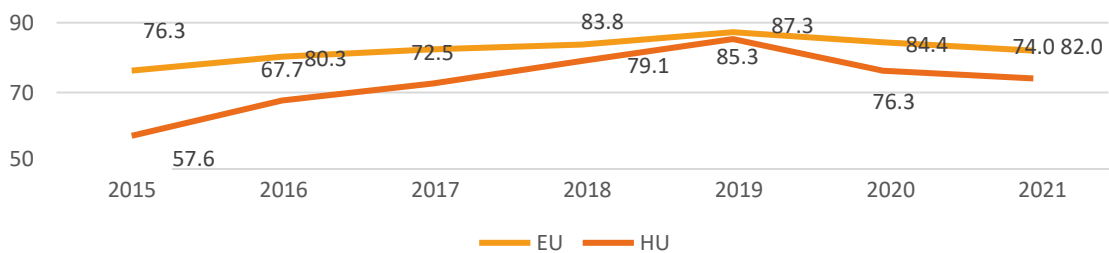
Hungarian results are strongly affected by the very low level of the **public data availability indicator** compared to the EU average (58% vs. 81%)[60].

It is important to underline that the DESI, when examining digital public services, only presents a slice of the client-side services, according to the life situations under review,

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[59] At the end of October 2021, there were 615,645 live Business Gateway registrations, with virtually all operating businesses having an electronic portal.

[60] The indicator is also likely to have methodological problems, as data for earlier years are not available.

thus, there are some highly successful Hungarian digital solutions that are not reflected in the results at all. A good example of this is the extension of the municipal ASP (application service provider) centre, e-invoicing, or IT solutions to prevent tax abuse, for example EKÁER, considered to be a development with outstanding results even internationally.

According to the eGovernment Benchmark Report published in autumn 2019, Hungary made significant improvements in most of the priority areas[61] and further improved its performance based on the eGovernment Benchmark Report published in autumn 2020. The report also highlights that Hungary achieved the second highest growth rate among all the countries surveyed between 2017 and 2019.[62] According to the eGovernment Benchmark Report published in autumn 2021, the improving trend in Hungary had been maintained for the third year in a row[63]

As regards the aggregate eGovernment Benchmark indicator on digitalisation, Hungary's score has improved from 42% to 63% since 2018, putting Hungary at the 18th place at present, while the penetration indicator measuring the actual use of digital services has increased from 35% to 70% since 2018, above the EU average, putting Hungary at the 10th place in the ranking. On the whole, Hungary from the lagging countries has moved into the middle range over the past three years.

Figure 48: Digitalisation and penetration (actual take-up) based on the eGovernment Benchmark 2021 report results and the change in the Hungarian result compared to 2018
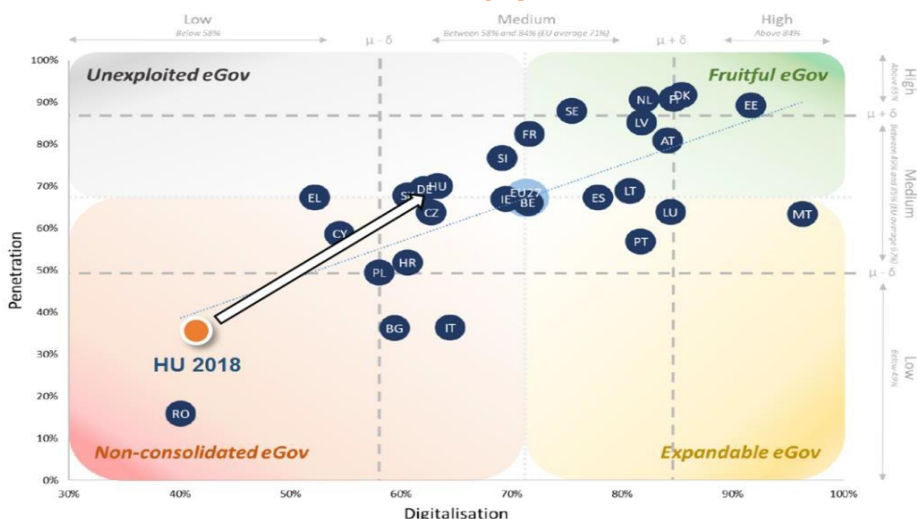
Source: eGovernment Benchmark 2020 – Insight Report

2.2.5.1 The situation of eGovernment services

The objectives set out in the previous National Infocommunications Strategy 2014-2020 have been mostly achieved by 2020. The majority of eGovernment bodies provides eGovernment services at least at a basic level from 1 January 2018, in line with the extensive entry into force of

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[61] Source: Report to the Government on the implementation in 2019 of the task set out in point 11(a) of the 2017-2018 Work Plan of the Digital Success Programme 2.0
[62] Source: eGovernment Benchmark 2020 - Insight Report
[63] Source: eGovernment Benchmark 2021 - Insight Report

Act CCXXII of 2015 on the general rules of e-government and trust services (e-Government Act), and further significant progress has been made in 2019-2020.

Based on past experiences, the majority of institutions fulfilled their obligations to provide e-administration at a basic level (e-Paper service; use of browser-based interfaces on the back-office side) in 2018. 2019 saw an increase in the number of agencies that have started to move away from their previous browser-based solutions towards automated, user-friendly and less labour-intensive administrative solutions by using machine interface solutions for various services.

In the area of digital public services, KÖFOP has made significant progress in providing a stable and secure IT environment and in the electronification of internal public administration processes, but citizens still lack access to a full range of key public services, personalised and of the highest quality, although the proportion of these lagging areas is steadily decreasing. As a result of the projects implemented or being implemented under the KÖFOP in the previous programming period, a number of central system components and specialised systems have been created which together have laid the foundations for a more uniform and efficient public administration and the possibility of forming data links between them. However, in order to further improve administrative efficiency, these systems need further integration, more support for automation and further strengthening of information security features.

The year 2020 brought significant progress in the digitalisation of the Hungarian public administration in many areas, even though the COVID-19 epidemic has also presented the public administration with unprecedented challenges.

In terms of digitalisation, the coronavirus epidemic created a situation where eGovernment solutions proved to be very effective in ensuring the functioning of the state in times of crisis, and that they can meet the needs of a large number of new users, which will provide the basis for further developments.

The number of users and the use of eGovernment services has basically continued to grow this year, but the epidemic had a dual effect: some services experienced even significant declines in use, while other applications that provided essential assistance during the restrictions saw a significant increase in use, such as the Authentication Verification of Documents (AVDH) or the e-Paper service.

In general, thanks to its recent developments, we have seen a very significant increase in the number of e-administration users and in the take-up of certain basic e-administration services over the past two years. By the end of 2021, 3027 cases were available on the renewed Magyarorszag.hu portal, i.e. the personalised case management interface (PIM), of which 439 cases were directly supported by the portal's integrated form manager, via a customer-friendly, web-based iFORM online form, another 210 cases via the EKEIDR form[64], 572 cases via e-Paper, 1201 cases via a direct link, and 409 cases with only case description available on the site. In addition, 14 small

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[64] The EKEIDR form is also a web-based form technology developed by the Prime Minister's Office to ensure the electronic handling of government office business.

applications[65] (e.g. Government Office appointment booker, JSZP vehicle query), are now also integrated in the portal, help to manage cases. The obsolete ÁNYK technology was still in use for 182 cases, but its share of all cases available on the SZÜF decreased to less than half in the last year, reaching 6% at the end of 2021.

The growth in uptake is underpinned by the fact that there were now more than 5.12 million customer gateway account registrations at the end of 2021, an increase of 14.3 per cent compared to the end of 2020, with new account openings more intense than the 9 per cent growth in 2020.

The number of active Company Gate accounts has now reached 650,000, with virtually every business organisation in operation having access to this service, and its use is steadily increasing: in 2019, 11 million, in 2020 15 million, and by the end of October 2021, the number of submissions through the Company Gateway reached 14 million.

In 2020, presumably largely due to the epidemic situation, the use of e-Paper increased by more than 80 percent (around 3 million submissions for the entire year), although at a slower rate, but this increased by a further 18 percent in 2021. More than 13 million authentications were performed in 2020 using the Authentication Verification Service (AVDH), up 42 percent from 2019, and this has increased even further in 2021, with 17.6 million documents authenticated by the end of the year, which is a 35 percent increase compared to 2020.

Regarding the use of the services available on the e-municipality ASP Portal, an average of 60 thousand cases were opened per month in 2020, stabilising at 40-45 thousand in 2021, after the local business tax return had to be submitted to the Tax Authority (NAV) as of 1 January 2021 due to a change in legislation. Essentially, the number of cases thus eliminated is the same as the number of local business tax cases previously handled through the ASP, so the level of use of the service has not changed for the remaining cases.

The full national roll-out of the municipal ASP has proven its worth, with usage statistics and the operation of the unified services, as well as the quality of the centrally provided systems, living up to expectations. The system was recognised also at European level in 2021, in the European Public Service Awards 2021 (EPSA 2021), a biennial competition of the European Institute of Public Administration (EIPA), supported by the European Commission and 10 EU Member States, the Local Government ASP 2.0 project was awarded the EPSA Special "Good Practice" prize in the category "Digital Public Administration". An important step forward in the digitalisation of local public services is the IKIR (Integrated Public Services Information System) project, that has created a complex IT system. This provides data and information that can be used to make informed decisions at a local level. So far, nearly 1300 municipalities and more than 1800 users have registered for the system.

A central government service bus (KKSZB) has been developed, which is an electronic central administration service based on a standardised, flexible, transparent service bus logic. The KKSZB guarantees that the verification of purpose and legal basis remains the responsibility of the bodies managing the associated registers.

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[65] The small application integrated into the portal is an interactive application developed with the SZÜF's own toolkit, operating integrated into the portal, enabling the execution of administrative actions related to a type of case, and suitable for the direct management of data sources and records of the institution publishing it. For example: booking an appointment at a government office or using the Vehicle Service Platform's vehicle query service).

Data connections are not slowed down, they are simply made manageable and transparent. With the launch of the technical interoperability platform KKSZB on 1 January 2018, the automatic exchange of data between registers and different services is now made easier. By the end of 2021, a total of 200 organisations had joined the platform (+82 in one year), with 334 systems. Starting from 2022, operators will be connected on a continuous basis, with 72 systems currently connected in a test environment and 28 in the live environment. On average, 60 million requests per month pass through the KKSZB's live environment.

The Document Authentication Service (DHSZ), which can be integrated into the Identity-Backed Document Authentication Service, optimised for public administration use, showed an annual growth of 112 per cent by the end of 2020, with 10 million documents authenticated, but uptake increased even further in 2021 to more than 15.18 million by the end of the year, an increase of almost 52 per cent compared to 2020.

However, in addition to the achievements listed above, it is also necessary to take into account the shortcomings that need to be addressed in the practical implementation of the objectives set out in this strategy and the measures that will break them down.

The Electronic Administration Supervision (EÜF) was established in connection with electronic administration, inter alia, to support the process of electronic administration, to supervise the operation of electronic administration in accordance with the law and to coordinate the implementation of electronic administration. The Supervision receives notifications and requests for authorisation, registers service providers who provide regulated e-Government services, and carries out inspections to verify proper functioning of the e-Government service.

The development of e-administration and its increasing use justifies the need to broaden the powers and activities of the Supervision and to increase its proactive supporting capacity.

Essentially, it can be concluded that some of the improvements made so far have been limited to the electronification of paper-based processes, but in many cases, a meaningful digital transformation requires a complete redesign of processes, often involving legislative changes.

It is important to note, however, that there are still some public authority systems that operate on a paper basis. The digitalisation of these is essential for smooth administration and efficient public administration.

A solution to protect consumer citizens has not yet been put in place, so it may be appropriate in the future to create a solution that can provide simple and quick access to formal means of resolving various consumer conflicts, disputes and complaints. Such a solution could facilitate the digitalisation of such processes and promote fair market behaviour and reduce market abuse.

There is a serious backlog in the creation of a single, interoperable data infrastructure based on data standards and a common ontology. Because of this shortcoming, the implementation of data-driven planning, decision-making and operations could not commence in a substantial way. This is why there are currently hardly any automated, proactive and predictive services based on artificial intelligence.

The lack of user-centricity is also reflected in the scarcity of e-services that handle complex life situations in complete processes. While there has been some progress recently in putting the principle of one-off data provision into practice, the process itself is still in its early stages. That said, it should also be stressed that the use of innovative technologies in these areas can bring significant improvements, but it is very important that they be customer-centric.

Another barrier to the uptake of eGovernment may be the lack of promotion, support of utilisation and transfer of digital literacy. This is why there is a need for extensive campaigns to promote the electronic public services already available and soon to be introduced, providing training for citizens and administrators on how to use them, and publishing user guides and information materials focusing on customer service.

Interoperability between public and market-based services has been achieved to a limited extent so far, and there is a long-standing need to make certain central building block services available also to economic operators. Overall, it is important to make progress in this area, which is a joint challenge with the Digital Economy pillar. It is an important step forward that pursuant to the amendment of the Government Decree 451/2016 (XII 19) on the detailed rules of e-Administration and effective from 2022, credit institutions and financial service providers within the meaning of Article 1 (1) (a) and (b) of Act LIII of 2017 on the prevention and combating of money laundering and terrorist financing will have access to certain central and regulated e-Administration services provided by the state free of charge, while the legal regulation for the provision of these services (for a fee) to other market players has been adopted, and the Government adopted the decree-level regulation in the autumn of 2021. At the same time, in 2021, there has been a steady increase in the number of operators connecting to the KKSZB service, with already 75 systems connected in test mode and 39 systems connected in live mode by the end of the year. The latest provisions of the Government Decree 451/2016 (XII. 19.) on the detailed rules of electronic administration now contain the detailed rules for the use of "central state services that can be provided to market players", and the rules for the calculation of the fees payable for these services have been further refined.

In order to realise the vision of the NDS Digital State in the period 2022-2030 by further improving the results achieved so far, it is necessary to address the gaps identified through the evaluation of the results of the NIS 2014-2020, user feedback, feedback from the sectors, international comparisons and studies (e.g. DESI report, eGovernment Benchmark benchmarking, OECD and UN studies).

2.2.5.2 Key strategic areas belonging to the digital state

2.2.5.2.1 Public service environment

In order to create a digital state, it can be beneficial to increase data connectivity and data delivery capabilities, to which services supporting the use of data assets, solutions supporting the protection of data assets and data-driven business intelligence (BI) can greatly contribute.

In the future, the aim is to create a digital public services environment that will enable citizens and businesses to manage their affairs independently of time and place, connecting administrators to customers and cases in a virtual space, using innovative technology solutions. They will help economic

actors to manage their various life situations in less time, with less energy and ultimately less money. It is important that, in line with EU policy objectives, greater emphasis be placed on the provision of cross-border e-administration, and that the necessary data connections be implemented through the KKSZB, both on the system and the service sides.

Alongside these development needs, the fact that the proliferation of mobile devices and the increasingly mobile lifestyles of customers require the creation of a single central mobile platform and the provision of a developer environment and toolkit for organisations that are obliged to or undertake to provide it, making electronic administration faster, simpler and safer, cannot be neglected.

The single administrative interface planned to be implemented using DIMOP Plus funds will reduce the number of specialised systems, previously accessible manually or only through formal requests to partner authorities, and the data stored in them, and will integrate as many systems as possible into this interface, thus ensuring more efficient and less time-consuming provision of tasks. It is able to implement client-side and administrator-side support and aims to achieve fast and efficient administration supported by automation. The solution will help certain public interventions and family benefits to reach their intended recipients faster and more efficiently than at present, which will also strengthen the effectiveness and impact of the measures. In order to support the operation of all applications, the central computing and IT network solutions will be upgraded, and their performance will be adapted and improved to meet the needs, taking into account the expected workloads. In addition, at sectoral and central level, there is a particular need to strengthen information security elements and cyber defence capabilities, in line with national and EU-level efforts. In civil and corporate matters, it is necessary to develop the use of secure, remote identification solutions (e.g. fingerprint and facial recognition technology) and to broaden the possibilities for acting in a role (both by legal representation and by a proxy). The technology can also be used for e-administration, where citizens do not have to provide any information to complete the electronic interface. When documents that previously existed only on a paper basis enter the electronic space, it becomes possible to certify the document without its physical existence. This saves considerable costs associated with document production and, in some cases, postage, which represent a very significant level of costs on an annual basis. These developments are expected to increase citizen satisfaction and improve the image of the digital service provider state. Extending the possibilities of e-administration will lead to a significant reduction in the use of paper and the need to travel to deal with administrative tasks.

At present, the way in which the identification of citizens in the different procedures works is heterogeneous across the different budgetary bodies. The creation of digitised content allows for its complex processing and rapid and cost-free access by economic operators. The data assets generated at the target groups can be used to create a single data structure for economic operators, for information and support purposes, and for the general public, to produce analyses in a simple and cost-effective way, or even to submit a standardised application, simplifying communication with service providers. Over the longer term, this single system will provide a basis for economic operators to monitor the status of their affairs.

An important prerequisite for meeting the requirements of the 21st century is that in all matters that do not legally require the personal presence of citizens or businesses the possibility to manage them in digital form in substance and in their entirety should be given.

The aim is to automate processes, using the Automatic Administrative Decision Making (ADM) toolkit developed in the KÖFOP project, which will simplify administrative processes, support the transformation of the underlying legislative framework and allow for operational support using the existing IT toolkit, including its targeted further development needs specification. The AKD process organisation and IT implementation includes the use of already available core system components (easy integration of SZEÜSZ and KEÜSZ solutions into processes), including applications using the latest artificial intelligence algorithms, and RPA-based interoperability with the so-called legacy systems, where necessary.

2.2.5.2.2 Economic policy, property and asset management

Hungary has not yet developed a practice for recycling public data assets, and in this area Hungary is lagging behind in international comparison. However, the use and evaluation of the data assets generated and being generated in the course of performing public tasks can also help in making economic policy decisions. As such, they are able to have an impact on issues related to taxation and the introduction of new taxes, and to predict their effects. They can also play a role in the pattern analysis of product sales processes, identifying spatial correlations, physical representation of raw material-finished product chains - and the spatial coverage of services - as well as investment goals. This can support the identification of logistics investment opportunities based on goods movement and transport data, the planning and implementation of transport optimisation interventions, and provide a basis for business life cycle analysis based on product portfolio and geographic location. The re-use of data could help boost the data economy, support economic and business development, and enable the market-based trading of data. In order to ensure efficient re-use of public data assets, institutional and data management frameworks must be put in place to enable the management of data assets.

There also exists a deficit in the re-use of spatial data assets, given that there is currently no IT system that would allow for the centralised management of public spatial data assets at the national economy level, or for their secondary use. The collection of spatial data regarding the natural and built environment in a central IT database and the development of a data reporting system on top of it would support the implementation of the processes of relevant public actors and help institutional decision-making. The use of spatial data would allow the monitoring of public aid projects and the analysis of changes in spatial data. Surveys of spatial data can be carried out using aerial data collection or remote sensing devices. In this way, a database of spatial data covering the whole country can be created. The provision of a single map and a spatial information base would speed up and simplify the administrative tasks of public administrations and make certain procedures more efficient and transparent. By reducing procedural times, direct cost savings can be achieved, and legal certainty and public confidence will be increased.

The Parliament's decision of 26 May 2021 on the new Land Registry Act will lead to the launch of the electronic land registration procedure in 2023. The e-property system, being a public register, is expected to come into force on 1 February 2023. The paper-based procedure will be replaced by an electronic, online procedure. It will be possible for the attorney to draw up contracts of sale and other real estate agreements as electronic documents with digital signatures, online authentication and digital submission to the land registry unit of the relevant government office.

The National Building Registry (OÉNY), which includes, among others, the ÉTDR (Electronic Documentation System for construction authorities), E-public utilities, E-construction logbook, does not currently allow for the data management, queries, analyses, processes and procedures related to construction to operate within a unified, digital 3D spatial platform, as 3D building registration is currently not available and real estate registration is done in 2D.

The data generated by the real estate market are currently not used and not integrated in other administrative systems, although they could be used in many areas. To further increase the usability of the data managed by public administrations, cooperation between registers and the information systems that represent them should be expanded. Trend analysis can be carried out on the basis of real estate sales and purchases data, and it may also be useful to create a data registry system to collect and integrate the data and information required for the state real estate registry and for the legal supervision of the real estate market, and to provide a single interface for the display of the data. Information on real estate can contribute to the identification of family support targets, complemented by data collected from other segments. To this end, it may be necessary to create a single interface that is suitable for recording and uploading information concerning the real estate market from various perspectives. Such developments provide useful information to a wide range of actors in public administrations and the economy, and offer significant benefits beyond those of a common register. The efficiency of the related administrative back-office processes will be improved through a single architecture system linked to the real estate market. The improvements will simplify the administrative processes involved, reduce processing times and improve the quality of the public services concerned as a result of integration and ICT support. It also makes it easier to obtain information on the sale and purchase of real estate.

2.2.5.2.3 Justice

The computerisation of specific steps in the judicial process is an important part of the quality of justice systems, as the electronic launch of proceedings and the online monitoring of their progress facilitate access to justice and reduce delays and costs. In addition, due to the growing importance of cross-border services in the DESI Digital public services dimension, it is inevitable that e-government services and case descriptions on the client side should be available in English in order to improve Hungary's international positioning. ICT systems of courts are playing an increasingly important role in cross-border cooperation between judicial authorities and facilitate the enforcement of EU legislation, for example in procedures related to

low-value claims. [66] Important progress has been made in this area, with digital company registration procedures now dominating the agenda, but so far only some of the processes are electronic. On the negative side, the low level of digitalisation of notaries is still a negative factor, but on the positive side, the level of acceptance of electronic signatures of lawyers has increased further as a result of the epidemic.

2.2.5.2.4 Healthcare

One of the most important objectives of the government is reforming healthcare, putting it on a sustainable footing and creating an efficient, quality-oriented, patient-centred healthcare system. The government intended to achieve this goal by increasing the involvement of the state and by restructuring the healthcare structure based on organisational integration, the professional directions of which were based on the Semmelweis Plan and the Healthy Hungary 2014-2020 strategy.

The e-health development projects conceived in 2011 laid the foundations for digital healthcare. By the end of 2015, the foundations for e-Health were in place and "up and running", on which to build the e-health developments of the new 2014-2020 programming cycle. At the heart of the national health IT developments is the National e-Health Infrastructure (EESZT). EESZT is a unified IT environment, connected to the IT systems used by healthcare institutions (clinics, hospitals, outpatient care institutions, general practitioners, pharmacies, private healthcare institutions from 2019 and medical device distributors from 1 November 2021). The integration and collaboration platform will connect existing siloed IT systems using modern, standardised technologies and provide a common language and tools for communication between actors. ePrescription, eReferral and EHR (Electronic Health Record) for structured data collection and transmission are the most widely used features of the EESZT.

Health policy and health care decision making is supported by the migration of data from medical systems to EESZT in the five years preceding the implementation of EESZT, which can also support secondary data use, such as scientific research.

Table 7: EESZT statistical data type[67]

EESZT statistical data name	pcs/person/time
number of connected hospital IT systems	108
number of connected pharmacy information systems	7
number of connected general practitioner systems	25
number of registered doctors	26,000
number of registered general practitioners	5,500
number of registered pharmacy workers	13,000
number of daily healthcare events	700,000
number of daily patient document entries	450000
number of daily prescription recordings	800000

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[66] Source: European Commission, 2019, The 2019 EU Justice Scoreboard https://ec.europa.eu/info/sites/info/files/justice_scoreboard_2019_en.pdf

[67] Source: EESZT Information portal, https://e-egeszsegugy.gov.hu/

number of transactions per hour	900000
number of daily transactions	9000000
average response time	350 ms

Over the past decade, the central and care system structure of the Hungarian health care system has been significantly improved, and further improvements are proposed in order to make the health care system sustainable, transparent, efficient, quality-focused and patient-centred.

As can be seen from the above, a number of central projects have been and are ongoing, with a tendency towards unification and data-driven operations, but fragmentation still remains. The care system and research sites are generating more and more data, the amount of elementary data in diagnostic findings is growing rapidly, they can provide information with a depth and resolution appropriate to a given level and use, but there are still limited possibilities for logical interoperability of systems, for exchanging information and for comparing information with other subsystems. In order to achieve a higher level of interoperability, the integration of the currently "isolated" medical systems and the digitalisation of the processes related to the operation of the EESZT interface are also a task for the near future, as well as the more complete interconnection of the existing systems with the systems of social security and pension insurance bodies, and the addition of the functions necessary for the assessment and verification of incapacity to work.

2.2.5.2.5 Transport

The possibility of accumulating and using public data (e.g. spatial data and regulatory systems) in a structured system for traffic management, through the creation of a central traffic simulation system, would pave the way for optimising road traffic management. As a result, the throughput of road infrastructure could be increased and road safety could be improved, while vehicle emissions would be reduced, leading to more efficient transport dynamics. Analyses that can be performed in a traffic simulation system would support institutional decision making in the area of infrastructure development and could serve as a starting point for the design of new traffic management systems. A highly accurate survey and mapping of transport infrastructure and road networks can also serve as a starting point for the HAD (Highly Automated Driving) map needed to support self-driving cars. The accurate representation in a 3D model of the surveys can be used, in addition to supporting the self-driving vehicle system, as a survey plan for future rebuilds and upgrades, saving time and money in the preparation phase.

The estimated level of unmanned aerial vehicle traffic in Hungary is expected to reach approximately 27 thousand flights/day by 2025, even according to conservative forecasts. On the one hand, there is significant development potential in creating a Hungarian "drone industry", while on the other hand, risks from a safety perspective are increasing significantly year after year. Unidentified Unmanned Aerial Vehicles (UAVs) in the air already pose a serious security risk. Thus, in the future, it may become necessary to develop an IT system for traffic management of drone flights, as part of the U- SPACE programme initiated by the European Commission.

It has become necessary to support the traceability of UAVs and the possibility of deactivation for defence purposes requiring immediate intervention, the first and indispensable condition for which is the development of an IT system for unmanned aerial vehicle traffic management (UTM). In order to guarantee security, the primary focus of UTM activities is on public monitoring, conflict detection and resolution, and the development of sensor and communication technologies needed for the integration into transport systems, which can be built upon to create a drone detection and warning centre.

2.2.5.2.6 Tourism

Nowadays, it is almost unthinkable to plan and organise a trip without using digital solutions. The need for digitalisation in the tourism sector was further intensified by the pandemic situation.

One of the strategic goals of the National Tourism Development Strategy 2030 - Tourism 2.0 is the creation of a digitally advanced sector, involving a comprehensive digital transformation of the sector. The measures included in the Strategy (such as the launch of the National Tourism Data Centre (NTAK) in recent years) aim to encourage digitalisation of the sector, to promote cross-sectoral digital solutions and to share information on a wider scale. Digitalisation is expected to make the sector more efficient and to improve guest experience. Digitalisation would also contribute to data-driven decision making.[68]

2.2.5.2.7 Municipal (digital) developments

A new, or more precisely, a more recent but not yet properly addressed paradigm of Hungarian urban and regional development practice, following global and European models, is the smart city operating model and its gradual introduction, as well as the creation of socially, environmentally and financially sustainable and liveable cities and regions over the long term.

Smart City is an approach to urban development, and more recently to regional development, originally based on the widespread use of digital technology solutions, but nowadays it stands for a much more complex urban development policy and development mindset. A municipality can be considered smart when concrete technological solutions become part of the daily life of the town or city, including transport (parking), daily administration (public administration), maintenance and use of public utilities, urban spaces and other services, such as human services. Over time, these services, used on a daily basis by the population, will form a coherent, coordinated city-wide operating system in the smart city.

Apart from the spectacular solutions, the smart city operating model is based on continuous digital information and data collection, data management and the organisation of tasks based on this. Smart management of municipalities also requires a responsible business approach, the result of which is not profit, but savings that can be spent on development and thus sustainability.

In Hungary, there is as yet no known city where the process of "smarting" simultaneously covers all functional areas of the city and where they form an interconnected (integrated) system. This is in fact still rare even on an international level. In Hungarian practice, the process has been initiated in selected sectors, such as urban public transport,

transport organisation, or the maintenance of public spaces. We can also find county towns, medium-sized towns and municipalities with smart city solutions, as well as partly smart municipalities that exist without significant spatial impact. In the latter cases, the solutions used are local ideas and the resources to implement them are locally generated.

In order to support the progress of this topic, Government Decree 252/2018 (XII. 17.) on the establishment and operation of a central platform service for smart cities was adopted at the end of 2018. The logic to connect to a central service is very similar to the so-called municipal ASP model, which is already well known in all municipalities at local level.

As regards smart city developments, it is also worth mentioning the Modern Cities Programme that financed such investments (e.g. the installation of urban camera systems) in Szeged, Békéscsaba and Miskolc.

In 2017, the Government Decree 314/2012 (8.XI.) defined the concept of Smart City and Smart City Methodology, and specified that a Smart City shall prepare its integrated settlement development strategy (ITS) based on the Smart City Methodology provided by the Lechner Knowledge Centre. Following the renewal of the planning of urban development and planning, pursuant to Government Decree 419/2021. (VII. 15) the Smart City Methodology is applicable for the revision of ITSs, as well as for the preparation and revision of the new type of plan and settlement development plans.

The Government, through the Lechner Centre, has created, operates and continuously develops an online smart city directory[69]. Every year, around 200 new examples are added to the catalogue.

Naturally, in addition to the above, the Digital State includes many more (separable) areas of expertise (cultural goods, sports, taxation, customs, construction, transport, energy, environment, waste management, employment, social affairs, police, disaster and national defence), and there is neither time nor reason to go into more detail on their situation in Hungary.

2.2.5.2.8 Sustainable development areas

The pursuit of sustainable development as an approach is a priority to ensure that the needs and requirements of the environment, society and the economy are taken into account in equal measure[70]. The European Economic and Social Committee aims to implement and adhere to the UN's 2030 Agenda for Sustainable Development, entitled Transforming our world: an agenda for sustainable development by 2030.[71] Through the Sustainable Development Observatory (SDO) a number of policy areas have been identified as essential to achieving sustainable development in the EU. Examples include promoting a just transition to a low-carbon, circular and resource-efficient economy, investing in innovation and long-term infrastructure modernisation, as well as encouraging sustainable business practices.

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[69]Source: http://okosvaros.lechnerkozpont.hu/hu

[70] Source: https://eionet.kormany.hu/a-fenntarthato-fejlodes-fogalma Date of download: 10/02/2022

[71] Source: https://www.eesc.europa.eu/hu/policies/policy-areas/sustainable-development Date of download: 10/02/2022

In order to achieve the sustainable development objectives, specific digitalisation actions are needed in the areas of climate change mitigation, environment and climate protection, circular economy and waste management. Below is a **sectoral breakdown** of the points that contribute to achieving sustainable development goals through **digitalisation**.

Water

The water sector as a whole is characterised by the existence of several state-of-the-art digital systems covering the whole country. Extensive development of the IT units has already taken place at several points, but these systems are now significantly outdated and need to be renewed. However, climate change is a phenomenon that also affects and influences waters and wetlands, therefore knowledge and the ability to process the resulting data is of paramount importance to support decision-making and the development of appropriate conservation solutions.

Sampling for water quality monitoring is typically carried out manually, on an ad hoc basis. In many places, but not everywhere, it is more efficient to carry out the sampling process with an automated system and installed probes capable of transmitting data, thus implementing remote monitoring. The analysis of the data collected can, among other things, help to detect early signs of deterioration in water quality. In the water sector, digitalisation should only be extended to those measurements where it helps to reduce costs or provides additional information. These automated systems can be set up in such a way that, once implemented, the data stored in the system will be accessible to water management and water protection authorities.

that examines the condition of surface and groundwater and geological features, and that is capable both of prevention and of documenting events that have already occurred. The data generated using the monitoring system could be used to exchange data with other sectors.

Waste management

The accumulation and re-generation of illegal waste is a serious problem also in Hungary. Detection and elimination of illegal landfills should be supported by an IT system that helps detection and contributes to preventing the re-emergence of waste. Detection can be effectively supported by various means, such as remote sensing devices.

Packaging waste and its handling is another major problem. The introduction of a deposit scheme for PET bottles, aluminium cans and glass bottles should be implemented, as provided for in Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste. In order to ensure efficient operation of the system to be implemented, it will also be necessary to develop an IT system for the storage of collection data, cooperation and accounting between actors, effectively supporting the development of a nationwide take-back system. The introduction of the system will reduce pollution and increase the amount of waste collected selectively, and will create a significant incentive to change the mindset of society towards a circular economy.

Waste collection vehicles are currently not equipped with tracking and waste handling recording devices, so it is not possible to optimise the movement of the vehicles in real time, or to check if the owners of the waste containers are paying for the waste collection service, or that the right waste is being placed in the right vehicle. In its current form, the design of the payment for waste collection is not personalised and misuse cannot be detected. Digital solutions can make waste transport more efficient. By installing IT systems and tools, vehicle tracking can be implemented and a customer-oriented accounting system can be developed. These improvements could help in reducing the number of non-payers, and the more favourable conditions could also reduce the amount of illegal waste being dumped.

Agriculture

In agriculture, knowledge of environmental parameters is of paramount importance for efficient production, nevertheless the sector is characterised by a low level of digitalisation in terms of measurements. Sensor systems capable of measuring environmental factors such as air and soil conditions are technologically available. These sensors provide continuous data, automated operation and high accuracy real-world data measurement in a cost-effective way. Digitalisation is essential for the efficient functioning of agriculture, and by acquiring these tools and technologies, the businesses interested can achieve efficient production.

Deployed sensor systems and remote sensing solutions can also contribute to streamlining data reporting and simplifying reporting obligations.

The digitalisation of agriculture can be greatly facilitated by a platform that aggregates, for example, meteorological or soil data, to help agricultural professionals make the right decisions. The platform can also serve a community function, facilitating the flow of information between farmers.

Environmental monitoring, emergency response, climate risk

In Hungary, there is currently no data of sufficient quantity and quality available from continuous measurements to support models for climate risk assessment, analysis and prevention. From an environmental point of view, spatial data assets - obtained from airborne data collection - can support tasks related to climate protection strategies for specific areas, climate vulnerability assessments of the built environment and green infrastructure. Another problem is that considerable amounts of data are stored in a non-digitised way, which makes it difficult for different climate models and analysis systems to work with the data. In order to analyse the impacts of climate change on environmental elements, to support climate change adaptation, risk management and related development, it would be useful to install data collection sensor systems that continuously measure the environmental parameters. Another important step would be the creation of a repository for receiving, analysing and storing data, and the digitalisation of existing non-digital data.

Current monitoring systems designed to reduce disaster risk are not using the most detailed models to examine environmental processes and the spread of

pollution and disasters. We need to develop a forecasting and modelling system that is capable of simulating the course of a specific disaster. Such a system can help with disaster preparedness and planning, and support response efforts. Using state-of-the-art technology and tools can help make the measurement of environmental data even more efficient.

Disaster response, alerting institutions and associations specialised in the prevention and management of incidents, is currently not performed in the most efficient way, and communication and liaison between the units and the base is not state-of-the-art. This could be improved by moving contact and communication to the online space.

Wind direction and wind speed measurements can support the analysis of natural disasters related to climate change, and the measured data can be used to prepare and refine forecasts and plans. This would greatly help climate change adaptation and risk management. Measurements should be carried out using cutting-edge technologies to achieve greater accuracy, and an IT analysis system capable of receiving, analysing and storing data should be developed.

A major objective of the continuous development, maintenance and operation of the entire public and municipal IT infrastructure should be the use of environmentally friendly solutions, with the least possible impact on the environment, data-saving and energy-efficient applications and computing capacities, and the use of technology solutions selected accordingly.

2.2.5.2.9 Energy

A significant share of Hungarian energy use is accounted for by small, decentralised consumer sites. Similar trends can be observed in electricity generation, where an increasing share of renewable generation is provided by smaller, decentralised actors. The transaction capacity of these market players is low, which significantly reduces competition in the market and is also detrimental from a security of supply perspective. To address this, a priority of both EU and Hungarian energy strategies is to increase the ability to advocate and bargaining power of consumers and decentralised, smaller actors. For this reason, both policies identify as a priority the creation and operation of energy pools that bring together these players and are able to procure and sell their production with adequate efficiency and at a scale that is already more relevant to the market. For energy communities to work optimally, electronic systems are needed to help coordinate the processes involved.

The current regulatory environment does not provide incentives for consumer intervention, as only above a certain size limit is it possible to enter the market of system-level services. On the other hand, the price of systemic services is unpredictable and no long-term contract can be concluded. As a result, the current environment does not encourage significant investments from own resources or support the development of similar systems, while the costs of alternative options are high from an economic point of view. As a result of the incentive measures, the number of actors using energy management systems in Hungarian practice can increase by orders of magnitude. The current owners of renewable energy producers have neither the IT nor the security background to protect their own systems, and among investors the cyber and national security

awareness is also low. Given that the risk of power plant outages already poses a significant national security risk already in the medium term, achieving an adequate level of cyber defence is critical but it cannot be attained through a decentralised solution.

In order to increase domestic energy efficiency, it may become necessary to support the development and deployment of AI-enabled IT systems for state-owned companies, municipalities, higher education institutions and SMEs, to monitor and optimise energy consumption and, where appropriate, energy production and storage in real time, thereby significantly reducing energy consumption at the level of the managed portfolio, as well as energy costs and administrative costs related to energy supply.

The possibility of consumer profiling can contribute to the uptake of flexible tariffs. With the proliferation of smart metering, sub-metering and sensors, a more accurate picture can be obtained of the energy use of individual consumers, but in practice this often does not result in actual efficiency improvements. Data is typically managed locally, and no systems are deployed to optimise instantaneous consumption at the level of a larger portfolio, in terms of grid usage costs, balancing energy or energy costs. In addition, demand-side response measures promoting the flexibility of the electricity system can be established, so that this smart development contributes to the integration of weather-dependent renewable electricity producers into the electricity system. Developing the integration of weather-dependent renewable energy producers could be of great importance in the future, based on the support of info-communication tools and IT solutions.

2.2.5.3 IT and cyber security

The IT and cyber security landscape is becoming more and more challenging every year. The increase in the number of internet users and the mass adoption of internet-connected (IoT) devices, among other things, significantly increase the likelihood of cyber attacks. According to expert analyses, the value of IT security and infrastructure investments has been growing steadily in recent years, with global IT spending totalling $3.74 trillion in 2019.

Even though businesses are increasing their IT security budgets and resources for monitoring threat events, many are unaware of the attacks that could cost them the most. The number of businesses claiming to be "100% confident that their network has not yet been attacked" has increased by more than 10% compared to the 2016 report and shows a 3% increase compared to the same period last year. This response is typical for the most vulnerable types of businesses.

2.2.5.3.1 *Hungarian cyber defence landscape*

Hungary is at **the forefront of** EU Member States in the **development of a modern cyber security legislative environment** and in the implementation of EU protection regulations and directives. In recent years, it has developed an organisational system for public authority and incident management in state and local government organisations, including the organisations defined in the relevant EU (NIS) Directive. The designating authorities of each sector have designated Hungary's critical systems and defined the essential

service providers, thus ensuring the function, continuity and protection of services, equipment and facilities essential to society.

Partially, in the case of public, but especially in the case of municipal systems and organisations, it has been observed that some of them have little or no other protection measures in place beyond their statutory administrative obligations - Information Security Policy, Action Plan - and their implementation. Reviewing, updating or enforcing policies can be difficult in some cases, but the capacity-building steps set out in their action plans are often not implemented due to a lack of resources.

The situation of IT security in Hungary has been significantly improved by the fact that the legislative amendments implementing the NIS Directive entered into force on 1 July 2020 and its implementing regulations entered into force thereafter. Furthermore, in 2020, Act CXXV of 1995 on national security services was amended, as a result of which the information security responsibilities of the National Security Service were further expanded, and the tools needed for the effective protection of Hungarian cyberspace were strengthened and expanded, with special regard to the cyber defence capabilities of the National Security Service.

As a Hungarian element of the cyber security certification system developed by the European Union, the Regulated Activities Supervisory Authority (hereinafter: SZTFH) was designated as the national cyber security certification authority as from 1 January 2022
as a result of the amendment of Act XXXII of 2021 on the Regulated Activities Supervisory Authority and Act L of 2013 on the electronic information security of state and local government bodies.

According to the package of proposals, all Member States should take steps to respond to and prevent cyber security challenges that have been identified or that may arise in the future in an appropriate and timely manner. Member States should, where necessary, give specialised services and authorities new powers to achieve the desired objective(s) by providing the appropriate legal framework. These include:

- There may be a need to tighten security standards related to the operation of mobile operators (tightening access, operation and restrictions on outsourcing of certain functions),
- Minimising the involvement of high-risk suppliers in critical infrastructures and, if necessary, limiting it completely.
- Promoting and requiring operators to adopt a multi-vendor strategy.

In addition to the competences and transformations indicated, supporting the digital state and e-government, and in line with the indicated ambitions of the government, the capability development issues of the defence sector were also addressed as another pillar of IT security, taking into account Hungary's defence and military national security interests, as well as the development needs of cyber space operational capabilities related to their federal obligations.

3. SWOT analysis

3.1. Digital infrastructure

Strengths	Weaknesses
• 4G coverage comparable to the EU average, data traffic growing steadily • High-quality and high-service quality national backbone networks, NGA coverage above EU average • Subscriptions above 100 Mbps above EU average • Hungary has more than ten times the EU average for ultra superfast (1 Gbps) broadband internet take-up • Continuous network development, both market-based and with state support (e.g. Superfast Internet Programme) • Well-structured institutional accountability, strong oversight by communications and competition authorities • Core public communications infrastructure with high availability and network security • Commitment of government and market actors to development and digitalisation • Public infrastructure in the field of supercomputing (HPC) already existing or under development • 5G spectrum largely allocated, commercial 5G networks available	• The exact route of certain telecommunications backbone networks is not always known • Slow implementation of supported broadband projects due to bottlenecks in design-build-construction-technical inspection capacities and delays in approvals • There are still unresolved telecommmunications, construction, administrative, market and other barriers (e.g. use of energy suppliers' poles) • High proportion of settlements only connected to one optical network, the situation resulting in a strong position of its owner over the local service providers and users due to lack of competition • Deployment of high-speed (fibre) networks in geographically disadvantaged (rural) areas is not viable on a market basis. • Outdated national standards for communications in some places

Opportunities	Threats
• Implementation of national infrastructure development reduces regional inequalities, thus promoting equal opportunities • Regulation can help ensure that the exact route of networks owned by market players is known • High NGA coverage paves the way for the spread of state of the art technologies, which can contribute to increased investment willingness • There are many new areas for progress in HPC. • By fine-tuning regulation and clarifying competition law requirements, network sharing can be actually promoted through a more detailed definition of network sharing objectives to optimise network sharing. • Enabling network sharing solutions for domestic mobile operators can accelerate roll-out of 5G, reduce the environmental burden and the costs of network deployment and operation. • Strengthening and encouraging cooperation (government, universities, research institutes, service providers, other market players) can lead to coordinated infrastructure development. • Creating cooperation between public and municipal networks and market networks, providing access to improve the efficiency of developments. • Assessing existing multi-purpose infrastructures, modifying related regulations and using them in a coordinated way. • (Additional) test network deployment possibility, in particular 6G. • The creation of a registry system to support the development of fixed and wireless communications networks, including a technical descriptive data about all operating electronic communications facilities and other technical specifications of the utility network infrastructure.	• Intense infrastructure development may lead to a renewed shortage of skilled workers (e.g. manufacturers, suppliers, designers, contractors) • The cost of deploying 5G networks is high, so the initial, significant investment by operators carries a high risk • In the context of modern infrastructure developments (e.g. 5G within a municipality), public distrust of new technology (e.g. fear of health risks) is considered to be high because of news published in certain press products and on social media, this needs to be counterbalanced by appropriate information. • 5G coverage is below the EU average. • The impact of supply problems of network construction materials on design feasibility: • daily prices, • uncertainty of delivery dates • the impact of extremely high energy prices and inflation on investment predictability the possible effects and escalation of a war or virus situation.

3.2. Digital competence

Strengths	Weaknesses
• The proportion of internet users among citizens aged 16-50 is high. • The legal background of the Digital Competence Framework System (DigKomp System) has been adopted, its professional concept and operational model have been elaborated, and its development has started. • Digital competence development programmes in action (e.g. GINOP-6.1.2, ECDL). • Existing digital curriculum developments for vocational education. • DJP Network with a nationwide coverage of 1681 DJP Points and nearly 2000 DJP Mentors. • Approved Digital Education Strategy (DOS). • The number of e-learning based training/further training courses is increasing in all segments (public administration, education, vocational training, corporate training). • Public education regulations include the knowledge needed to acquire high level digital skills. • Thanks to the Sulinet and Student Network programmes, the digital infrastructure has improved and the number of devices available in schools in Hungary has increased. • Full Internet coverage, high WiFi coverage in institutions in public education and vocational training.	• High proportion of people without digital skills. • Awareness about adult training programmes is low, as is the willingness to participate • The overall population has a lower number of participants in digital literacy programmes. • The number of people who never use the internet is high. • There is no developed and applied, comprehensive, systemic digital literacy development method and practice specifically for disadvantaged people, and existing practices do not adequately reach this group. • There is a need to encourage the training of professionals in order to increase the proportion of IT specialists and digitally highly skilled workers in the Hungarian labour market.

Opportunities	Threats
• Driven by the virus crisis, many of those who previously refused to embrace digitalisation are now realising that they need to develop their digital skills. • The development of DigKomp-based programmes and the introduction of the DigKomp toolkit, which is task-based, measures, develops and certifies digital knowledge (exams), stimulates the interest in training courses. • Expanding existing digital education and skills development programmes and good practices. • Developing digital curricula for vocational education and training, and making them as widely available as possible continues. • By launching mass (free) digital literacy programmes, the proportion of the population without digital skills will decrease and the proportion with high digital skills will increase. • Further expanding the DJP Network and increasing the visibility and traffic of DJP Points will help engage and motivate non-internet users. • By expanding e-Government services and case types in a customer-friendly way, the use of the internet and digital literacy of the population can be increased. • By further strengthening cyber security and educating customers, the public's motivation and confidence to use the internet can be further increased. • Targeted programmes for specific groups (e.g. jobseekers, parents, elderly) are offered coordinated by DJKK. • Free, online, high-level ICT training for mothers with young children will be provided, helping to reduce the shortage of ICT experts. • Market players are playing a greater role than ever in developing digital literacy (private-public cooperation programmes). • Young people are turning to ICT careers in greater numbers, allowing for an increase in the number of people enrolled in ICT education/training. • Digital competence development within	• Large numbers of people without digital skills: a) decreasing employment opportunities b) hybrid solutions need to be maintained further c) deceleration in the spread of digital cost efficient solutions d) the technology advantages (e.g., health solutions) cannot be realised • The 50+ age groups are durably "stuck" in the group of digitally illiterate, and therefore their employment opportunities are also deteriorating significantly. • The lack of digital skills development further exacerbates the exclusion of disadvantaged social groups and makes their integration into the labour market impossible. The digitalisation of the workplace is happening faster than the training of digital workforce. • There are not enough ICT specialists, engineers, technicians and skilled workers to implement digitalisation developments and operate communications networks. • The lack of support (e.g. lack of equipment) means that today's state-of-the-art digital learning environment will not evolve. • Possible lack of ICT development in public education and higher education institutions may cause shortages on the labour market, problems of competitiveness to individuals, companies and the state.

the entire framework of education could significantly increase the capacity of the labour market. ● The creation of a single, information-rich database not only reduces the administrative burden, but also helps students make decisions about their future. ● Education in technologies such as artificial intelligence helps to make it easier for everyday users and workers to adapt to new ways of doing things.	

3.3. Digital economy

Strengths	Weaknesses
- Adopted strategies for SME development and innovation. - Digital business development programmes built on each other (e.g. the Modern Enterprise Programme). - An advanced digital network infrastructure that can support business operations in most places. - Nearly 100% of businesses have an internet connection. - Office ICT tools are available. - The use of smart phones is widespread among businesses and employees in businesses. - Digital economy provides at least 20% of GVA. - The "Information and communication" sector accounted for 8.7% of total R&D expenditure in Hungary in 2019. - The ICT sector is the second largest exporter in Hungary after the automotive sector. - The government has recognised the importance of the data economy with the adoption of the AI strategy and the creation of the NAVÜ and has already launched targeted actions in this area.	- In many cases, business leaders are not open or sufficiently informed about new solutions. - The digital readiness of SMEs is well below the EU average, and the situation is even worse in the case of micro-enterprises. - Online presence, new technologies and e-commerce have a low profile. - Lack of integration of processes within the company. - Some sectors (tourism, construction, food, logistics, retail) are lagging behind in digitalisation in a more significant and specific way. - Funding (e.g. collateral) gaps for a large proportion of ICT firms, which hampers their participation in tenders. - A large proportion of businesses, especially ICT businesses, operate in the central Hungarian region, but so far EU funding has typically been available only in regions outside this region. - There are few Hungarian hardware micro, small and medium-sized enterprises and their production and exports are small. - Companies are not making good use of the potential of external and internal business data.
Opportunities	**Threats**
- The generational shift in businesses is helping to put digital development on the agenda. - In the wake of the coronavirus crisis, more and more companies are turning to digitalisation. - Further development and strengthening of the existing digital network infrastructure. - Continuing well-established development policy programmes. - Increased and specific support for the digitalisation of sectors. - Using new types of development policies (e.g. vouchers).	- Business leaders, especially micro-enterprises, will still not be receptive to digital solutions. - The crisis is diverting resources away from digitalisation developments to ensure day-to-day business operations. - In the next development policy cycle (2021-27), the scarcity of opportunities for businesses in Budapest to apply for funding will remain. - The lack of trust in digital solutions by economic operators is exacerbated by the fact that the algorithms on which they are based are not transparent

• Supporting the use of new technologies in firms through targeted tools and public services. • Increased access to direct EU funding (e.g. Digital Europe Programme). • Increased use of eGovernment opportunities by businesses. • To position and support domestic (owned) ICT equipment manufacturing companies. • Providing R&D and innovation resources In the ICT sector with dedicated calls for proposals. • The development of mentoring and support services can contribute to a more intensive development of innovative companies in the ICT sector. • More cohesion funds will be available to companies in Budapest and Pest County. • Domestic data assets are utilised in the Hungarian economy. • Efficient use of domestic data assets improves business competitiveness.	• The lack of integration of the domestic ICT sector into the international R&D&I ecosystem. • There can be a significant demand for IT and digital specialist jobs in a short period of time.

3.4. Digital state

Strengths	Weaknesses
- A single legal framework - Renewed central infrastructure (e.g. Government Data Centre) - Available, functioning core services, building blocks, good practices in place - Centrally kept public registers - Widely available e-government facilities - The new EIF portal provides a good basis for providing customer-friendly services, based on customer feedback - Skilled workforce - high number of graduates - Restructuring of the public administration performed - Training and further training system established - Cross-sectoral e-Health institutional foundation in place - A unique international health data asset available Sectoral e-Health foundations are in place - There are initiatives and high quality solutions available in Hungary in the field of smart cities - The public sector information security architecture is in place - Implementation of EU legislation has been completed, the legislative environment has been renewed - The incident management centre for state and local government bodies, critical systems and service providers providing notifiable services is established - The new Information Security Authorities for Critical Systems, Facilities and Services is in place - Terms of reference to achieve the required level of security for existing e-Public Services and, in the case of systems, security class - IT developments receiving government support are subject to security standards - The domestic intellectual base for development is strong enough - Experience from previous projects available - Availability of high-level public knowledge centres on digitalisation (LNC)	- Obsolete local infrastructure - Legacy systems - User-centricity not yet fully adopted - Many outdated services fail to integrate new building blocks - Insufficient proportion of online, structured forms that can be pre-filled with data - Services not always transparent enough - Lack of communication on eGovernment - existing services are not always known and there is a lack of training and education - Individual, non-standardised developments and the use of isolated solutions still occur due to persistent sectoral operations and ambitions - Uneven development in both territorial and functional (organisational) terms - Lack of regulation at implementation level in certain (usually more specific) areas - Varying quality of law enforcement in different fields - Centralised services have not been rolled out in all areas - Database content in need of data cleansing, data quality improvement and strengthening of service capability - Regulated re-use of national data assets not yet solved - Exploitation of e-Health sectoral development deliverables to be further improved - No uniform or converging Smart City development practices among municipalities - There is insufficient cooperation between the private and public sectors in the area of information sharing on information security, and potential mutual assistance and support capacities are not properly exploited - A consistent cyber defence capacity building and competence development for public interest infocommunications systems is needed - The existence of information security controls is only verified at administrative level

Opportunities	Threats
• The general application of the renewed magyarorszag.hu (SZÜF) central portal can improve customer experience • Increase user-friendliness by making interfaces and texts professionally accessible • More opportunities for automation through structured online forms and data links • Improved customer experience due to the existing funds could increase the proportion and satisfaction of users • Leveraging AI and other emerging technologies Providing significant new resources for digital public services over the period 2021-2027 developments (e.g. from the Digital Europe Programme) • Increased public confidence also allows for the implementation of conceptual changes • Growing customer demand to expand e-Public Services • Developing an economic forecasting system would support an effective decision-making system and process • High level services can be built on public registers • Development of modular methodological guides for IT projects of varying complexity • Greater use of demand-driven innovation in public digital procurement • Developing a complex set of data asset rules to promote the data economy in the framework of the AI Strategy • Innovative technologies in healthcare • The foundations for data-driven healthcare are in place • Advanced smart solutions will be applied in many areas of urban management • Developing state-supported cyber defence service packages for the SME sector • Establishing a sectoral CERT/CSIRT system • Definition of competences expected at each level of information security training	• Lack of user focus can scare away potential users • Continuing with the logic of paper-based administration does not realise the real benefits of digitisation • Failure to meet e-Public Services needs leads to reduced take-up • Public services based on legacy technologies face increased data and information security risks • The private sector has a significant labour drain effect • Excessive institutional and IT centralisation could undermine e-Health objectives • Municipalities and local authorities continue to pursue their own, uncoordinated and uncoordinated policies regarding their digital public services • No incentives are developed to increase the proportion of organisations in the SME sector with an information security policy • Detection of cybercrime incidents can lead to penalties from the state • Different levels/lack of training reduce the value of IT security professionals. • Emerging information security threats from new technologies • A trend towards an increase in the number and sophistication of cyber threats to electronic services and systems • The low digital literacy rates that are emerging in some age groups of Hungarian society could lead to a decline in Hungary's cyber defence capabilities and reduce trust in digital services. • There are important and irreplaceable data that are part of the national data heritage, which have been lying dormant until now (e.g. in the construction sector) and are in danger of being slowly destroyed

• The development of energy management systems and IT developments to support the integration of renewable energy producers into the electricity system, together with the development of appropriate protocols, will contribute to increasing the flexibility and stability of the sector • The deployment of sensor systems to measure environmental parameters will contribute to climate risk management and adaptation to climate change, while the detection of illegal landfills supported by IT systems will contribute to the closure of these landfills and the protection of the environment	•

4. Vision and objectives

4.1. Complex strategic objectives

4.1.1. Vision

Digital transformation will inevitably reach almost all subsystems of the economy and society. In the 21st century, the ability to adapt to changing conditions and to seize new opportunities is based on digitalisation. Today, there is no question about it: digitalisation is the engine of the economy, bringing its positive effects to every sector. Digitalisation increases efficiency, boosts prosperity and productivity, and improves competitiveness.

The benefits of digital transformation can be felt in everyday life through more efficient resource management, marketable business models, higher quality and equal opportunities in education and facilitating digital public services.

Recognising the need for digital transformation, the vision of the NDS puts digital economy, digital skills development and digital public services, as well as AI and automation solutions at the heart of Hungary's competitiveness and modernisation efforts. As a result, Hungary aims to **move up from its current 22nd place in the ranking to the top ten European countries in terms of digital economic and social development by 2030.** Thanks to this progress, digitalisation can be a **breakthrough** for the Hungarian economy and society also at an international level.

A major prerequisite for the realisation of the above vision is the **long-term and consistent representation of the Government's commitment to digitalisation** in government communication, operations, resource allocation, and also in the fields of economy, research and education. In order to support digitalisation efforts, the Government will seek a broad partnership with the European Union, domestic economic actors, civil society organisations, the education and research sectors, and will place particular emphasis on the need for the public actors involved in digitalisation to contribute to the improvement of the country's digital well-being in a coordinated manner, pursuing common goals and exploiting the synergies offered.

Ensuring equal access to digital opportunities, transparent, user-friendly digital services responsive to citizens' digital preferences, **full accessibility of public services** via standard mobile devices and full digital accessibility of public services in line with the web accessibility directive are necessary **to ensure social inclusion**.

These objectives, which are reflected in several intervention areas of the NDS, are in line with the conditions set out in the **Berlin Declaration** on the digital society and value-based digital governance, to which Hungary is a signatory, and earlier in the Tallinn Declaration, and the set of objectives and tools have been developed in line with these Declarations. The set of criteria set out in the Declarations is well reflected in the requirements set out in this Strategic Plan, which can be implemented by building on and benefiting from the results of the ICT developments in Hungary in recent years.

4.1.2. Complex objective

The overall objective of the NDS is to ensure that **Hungary identifies and leverages the potential of digitalisation in the fields of economy, education, research, development and innovation, as well as public administration**, thus **contributing significantly to the country's competitiveness and the well-being of its citizens.** An important aspect is the **consistent representation of a service provider, equal opportunities and dialogue-seeking approach** and the **strengthening of** supportive **functioning**.

4.1.3. Specific objectives

The fulfilment of the overall objective of the NDS **in the case of each pillar is supported by the following pillar** and specific objectives.

Pillar	Digital infrastructure (DI)
Complex objective	Availability of wired and wireless digital infrastructure of sufficient capacity and quality of service so that the digital ecosystem will not suffer from bottlenecks due to the lack of high-capacity infrastructure.
Specific objectives	DI1: Proportion of households covered by a Gigabit-capable network to reach 95% by 2030
	DI2: 5G coverage to reach 67% by 2025
	DI3: At least 75% coverage of district headquarters with National Telecommunications Backbone Network (NTG) endpoints by 2025
	DI4: Percentage of public education and training institutions with a network connection of at least 1 Gbps bandwidth to reach 100% by the end of 2030
	DI5: Hungarian high-performance computing capacity to reach 15 Pflops by the end of 2030

Pillar	Digital competence (DK)
Complex objective	Increase the proportion of digitally literate employees and the number of IT professionals (especially women) and reduce the number of people who are digitally left behind), by continuously improving the digital competence and user awareness of the population and the digital skills of workers.
Specific objectives	DK1: Proportion of people without digital skills (proportion of people aged 16-74 years not using the internet) to fall below 5% by 2030
	DK2: Proportion of regular internet users in the age group 16-74 to reach 95% by 2030
	DK3: Percentage of BSc graduates in higher education in computer science to reach over 10% by 2030

Pillar	Digital economy (DG)

Complex objective	Increase the digital readiness of businesses, digital technology integration, stimulate the development and diffusion of innovative digital solutions in all sectors, and improve the performance of Hungarian SMEs active in the ICT sector, in particular start-ups, in line with the priorities outlined in the Smart Specialisation Strategy 2021-2027 (S3). A priority is to support the data economy, in line with Hungary's Artificial Intelligence Strategy.
Specific objectives	DG1: Percentage of enterprises with integrated (digitised) (with to exceed business processes ERP) 32% by 2030
	DG2: Percentage of enterprises using Big Data analytics to reach 15% by 2030
	DG3: Percentage of enterprises selling online to reach 25% by 2030
	DG4: Proportion of R&D expenditure in the "Information and communication" sector as a percentage of total % of domestic spending for this purpose to exceed 11% by 2030

Pillar	Digital state (DS)
Complex objective	Broadening the range of available customer-friendly digital public services and improving the openness and motivation of citizens and businesses to use these services, enabling cross-border service delivery in the areas required by the EU, and increasing the efficiency of front-office and back-office processes by automating and building the interoperable data networks needed for data and cloud-based operation.
Specific objectives	DÁ1: Users of e-Government services (internet users submitting forms) to reach 90% by 2030
	DÁ2: The DESI indicator "Automatic completion of forms" to reach 90 points (out of 100)
	DÁ3: The DESI indicator "Full online administration" to reach 95 points (out of 100)
	DÁ4: The DESI indicator "Digital public services for businesses" to reach 95 points (out of 100)
	DÁ5: Hungary to become self-sufficient in the provision of government services and the storage of necessary data in the cloud (at least two thirds of these services to be provided from local infrastructure).

In each pillar, the above specific objectives should be met to **improve the ranking of Hungary in the relevant DESI components**.

4.2. Indicator system

In line with the overall objective, and given the importance of international comparability, the indicator system of the NDS defines the focus areas of the indicator system **in line with the European Union's Digital Economy and Society Index (DESI) measurement system**:

- Digital infrastructure (Connectivity);
- Digital labour market, education and training (Human capital);
- Integration of digital technology in the economy (Integration of digital technology);
- Digital state (Digital public services).

Each focus area contains both the prevailing DESI indicators and can be supplemented with indicators specific to the situation and problems of a the country in question.

DESI indicators are linked to baseline values, international benchmarks and strategic target values (over what timeframe, how much improvement is strategically expected). Indicators with only domestic data should be provided with a baseline[72] and a strategic target value.

The indicator system can include individual indicators and composite indicators (combination of several indicators). Of the latter, the Digital Economy and Society Index (DESI) is of particular importance.

Objectives and indicators per pillar:

It is necessary to indicate the main DESI sub-indices related to each pillar and to set targets over the time horizon of the Strategy. The main professional indicators on which progress is sought in each topic are also listed.

DIGITAL INFRASTRUCTURE

Indicator	Baseline value (year)	Target value (year)
DESI Internet access indicator (subindex) annual value	**57.6 (2022)**	**70 (2030)**
Percentage of households covered by a Gigabit-capable network	79% (2022)	95% (2030)
5G coverage	17.6% (2021)	67% (2025)
Availability of National Telecommunications Backbone Network (NTG) endpoints in district seats	50% (2020)	75% (2025)
Percentage of public education and training institutions with a network connection of at least 1 Gbps bandwidth % of institutions	9.1% (2021)	100% (2030)
National supercomputing (HPC) capacity size	0.45 Pflops (2020)	15 Pflops (2030)

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[72] This requirement means that only domestic indicators in connection with which there is a possibility and intention to measure them should be included in the indicator framework**.**

DIGITAL COMPETENCE

Indicator	Base value (year)	Target value (year)
DESI Human capital indicator (subindex) annual value	**38.4 (2022)**	**55 (2030)**
Percentage of people without digital skills (proportion of people aged 16-74 not using the internet)	9.9% (2021)	5% (2030)
Proportion of regular internet users in the age group 16-74	82.3% (2021)	95% (2030)
Percentage of BSc graduates in higher education in computer science	4.9% (2020)	10% (2030)

DIGITAL ECONOMY

Indicator	Base value (year)	Target value (year)
DESI Integration of digital technologies in businesses (subindex) annual value	**21.6 (2022)**	**45 (2030)**
Percentage of enterprises with integrated (digitalised) business processes (with ERP)	20.9% (2021)	32% (2030)
Percentage of enterprises using Big Data analytics	7% (2020)	15% (2030)
Percentage of enterprises selling online	15.9% (2021)	25% (2030)
R&D expenditure in the "Information and communication" sector as a percentage of total domestic expenditure for this purpose	8.7% (2019)	11% (2030)

DIGITAL STATE

Indicator	Base value (year)	Target value (year)
DESI Digital public services indicator (subindex) annual value	**57.4 (2022)**	**75 (2030)**
Users of e-Government services (percentage of internet users submitting forms)	81.5% (2021)	90% (2030)
Automatic completion of forms (0-100 points[73])	59,7 points (2021)	90 points (2030)
Digital public services for citizens (0-100 points)	64,4 points (2021)	95 points (2030)
Digital public services for businesses (0- 100 points)	73,8 points (2021)	95 points (2030)
Percentage of provision of electronic public administration services and the necessary data for digital citizenship through the national cloud infrastructure [74]	-	67% (2030)
Open data	58% (2021)	90% (2030)

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[73] Value normalised using DESI methodology, and based on eGovernment Benchmark results as data sources

[74] Not a DESI methodology indicator, but a national indicator

5. Toolkit

5.1. Methodological introduction

When designing the toolkit, we aimed to **build on the strengths and opportunities** identified in the domestic situation analysis and the SWOT analysis, and to propose ways to address weaknesses and threats, **taking into account** the international strategic environment and **good practices**, in such a way that the proposed tools most effectively support the realisation of the overall vision of the NDS and the specific objectives set out under each pillar.

When compiling the set of instruments for the we basically **reviewed, combined or extended the intervention recommendations of relevant strategies** already prepared (adopted, submitted or identified in the work phase), and **in several cases we proposed new measures based on the situation analysis and SWOT findings**. It is proposed to develop these in detail at operational level when preparing the action plan.

When compiling the set of instruments, particular attention was paid to the fact that **digitalisation can play an important role also in mitigating the economic and social consequences of the COVID-19 epidemic**.

The toolbox is **structured in a coherent way** across the pillars, although the importance and weight of different types of interventions will naturally vary between the pillars. The intervention proposals presented by pillar are essentially composed of **instruments of a public policy, regulatory and development policy nature**.

Public policy instruments

- **Strategy formulation and monitoring**: the success of public policy (and further, regulatory and development policy) interventions depends on the availability of well-prepared strategies and a monitoring system capable of tracking their implementation;

- **Research, surveys:** well-designed research, surveys and analyses are essential for the effectiveness of both strategy development and monitoring activities, and also play an important role in supporting socialisation and communication;

- **Communication, socialisation:** the success and effectiveness of public policy measures depend on the channels and effectiveness with which the government's ideas on a given development area reach the people who are the most affected: citizens and businesses;

- **Institutional system**: the implementation of strategies, and thus the success of a given policy area, depends to a large extent on the preparedness, efficiency and transparency of the institutional system implementing it.

Regulation: perhaps the most powerful element of the strategic toolbox, it can deliver effective results even when public policy instruments are no longer sufficient and development policy instruments are not available, for example because of a lack of resources. An important consideration, however, is that the cost of **regulation**, both on the public side and on the regulated market side, is

something the legislator should take into account. Due to the high cost of network development, operators expect a predictable regulatory environment and a favourable tax environment from the state to compensate for the high level of risk they are undertaking.

Development policy instruments (aid, financing): this includes all instruments by which the state allocates its own resources or those of a donor organisation (typically the EU) to development activities that achieve the objectives of the strategy (e.g. domestic and EU development funds) or forgoes a source of revenue for similar reasons (e.g. tax reliefs, abolition of special taxes).

5.2. Digital infrastructure

The **availability of an adequate quality digital infrastructure is a prerequisite** for the digital economy to grow, for citizens and businesses to develop their digital competences, and for public digital services to be deployed and used. At all levels and in all sub-systems of fixed and wireless networks, we need the kind of transmissivity that **ensures** uncompromised, efficient access to digital services and content for **every household, business and institution in the country**.

With the continuous growth in the number of users and the increase in average bandwidth demand per user, the **traffic of digital networks** in Hungary **will multiply** over the next few years. The main drivers of growth will be the **spread of mobile internet and smart phones**, as well as the growth of **digital on-demand** video traffic, but specific mobile applications (navigation, energy metering, remote monitoring) may also become mass-market.

The integration of networked electronic devices, the proliferation of **machine-to-machine (M2M)** communication and the Internet of Things (**IoT**) will significantly raise the expectations on network capacity and reliability in the coming years. Bandwidth demand will be driven by further expansion of **cloud** computing and the growth in the supply and use of **e-government and e-health** services, and in the longer term by virtual (VR) and augmented reality (AR) based gaming and working, and **high fidelity holographic** communications[75]

Although the situation analysis shows that **one of the strengths of the Hungarian digital ecosystem** is the well-developed (fixed and wireless) digital infrastructure, which reaches and sometimes even exceeds the EU average in terms of both coverage and quality of service, **further significant developments are needed** in the coming years to achieve the targets set out in the target framework, as a continuation of the investments supported by the SZIP. This requires the appropriate cooperation between market players and the state, and the creation of an investment-friendly environment.

Eligibility criterion (National or Regional Broadband Plan) 1 b) for the European Regional Development Fund (PO3) for the 2021-2027 development policy planning in the field **(National or Regional Broadband Plan)** requires **consultation** (with service providers) and criterion 2) **justification of public interventions** based on investment models.

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[75] Source: ITU (2019), A Blueprint of Technology, Applications and Market Drivers Towards the Year 2030 and Beyond https://www.itu.int/en/ITU-T/focusgroups/net2030/Documents/White_Paper.pdf

For several years now, a key element of the preparation of **digital network development programmes** (tenders) in Hungary, which are intended to open up to market players the **digital network development programmes** (tenders) affecting residential, business and non-state institutional endpoints and users, has been the extensive consultation on places of demand to develop, in order to **avoid that state support is not allocated to** those areas where **it is profitable to carry out broadband development** on a market basis. This is what is happening in the current Superfast Internet Programme, and this is what is planned for the 2021-2027 budget cycle.

The number of households in Hungary is just over 4 million. As shown in the situation analysis, approximately 21.4% of them are currently not covered by high-speed networks, representing a total of 856 thousand households. Based on previous development policy experience, slightly more than half of this is nevertheless covered by market players from their own resources, but there are certainly 3-400 thousand households left where modern network connections cannot be built without state support. The state-supported developments of recent years show that households are not limited to one geographical area, but are present in all municipalities where it is not worthwhile to develop on a market basis, mainly because of the greater distance from the centre and the resulting higher investment costs.

The specific costs of NGA technology deployed under the SZIP are higher, so the average amount per household is around HUF 250-300 000, i.e. the total investment cost is around HUF 220-250 billion. If the improvements are implemented in the coming years within the frames of the competitive tendering system applied under the SZIP, and a proportion of households (50%) is supplied by the service providers on a market basis through self-supply, the required subsidy is expected to be between HUF 82-93 billion, based on an average 75% state support.[76]

The planned gigabit-enabled developments will focus on closing the gap in gigabit-enabled access to business and residential places of demand, and covering all public and municipal institutions. In addition to the active involvement of the state, market consultation is the basis for channelling the views of relevant service providers, the public and other stakeholders, such as professionals.

The NDS highlights four investment models suitable for achieving this goal:

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[76] The Gigabit 2030 programme can fully rely on the results of the SZIP's fibre deployment (FTTH, RFoG), which represents 86% of SZIP projects, and the current 49% coverage is based on that.

The average required state aid intensity of 75% is an estimate, which has been typical for developments in the SZIP, but it is known that covering the last households always costs much more in terms of both money and time.

Figure 49: Possible investment models[77]
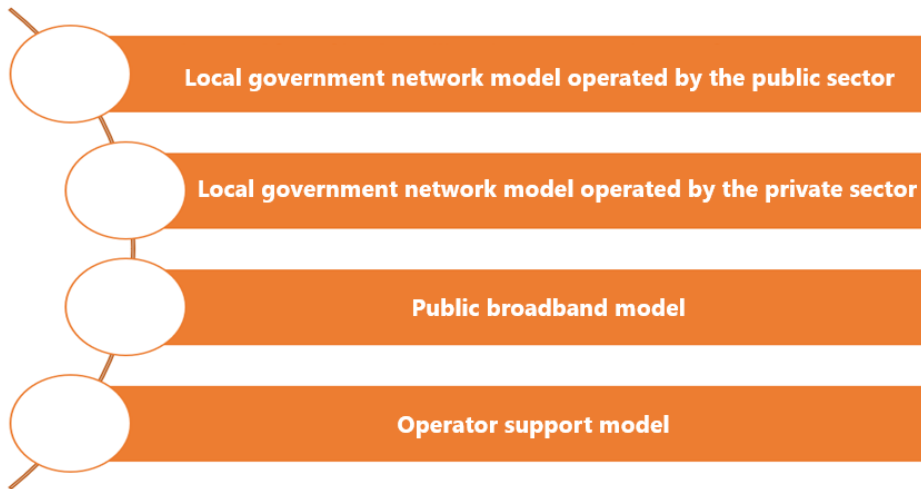
If there is a business case for development, the most likely model would be for a private company to build and operate the network, which would then be commercially owned by it.

If the development is partially viable or viable overt the long-term, the **state will impose certain obligations on** the network owner/operator in **exchange for the subsidy** (e.g. providing open access to the network to other operators by providing wholesale services, pricing based on reference prices, providing NTG/DJG infrastructure capacity (dark fibre) to the state, etc.). Typically, the model is used in areas where private companies are not willing to invest in network development on a market basis alone, but are willing to invest a certain amount if a part of the investment is subsidised.

The service providers will provide information on their investment plans within the frames of the **annual monitoring of the implementation of the strategy in during a consultation**. If it proves necessary to achieve the objectives, public outsourcing may be justified.

In the case of the private sector-operated **municipal network model**, the state concludes a contract with the private sector player for all activities related to the construction and operation of the network, but the network remains under the ownership and control of the state.

If the investment is not made on a market basis, not even with subsidies, the public construction model, where the state builds and the state operates, can be justified.

For regional (upstream) network developments, the decision on which model to use should be **based on market consultation**.

When developing public networks and access to public institutions, the **state designs, builds and operates the network,** the infrastructure built by the state remains state-owned and the network is operated by the state through a state-owned company.

This can ensure that digital infrastructure development programmes **only** invest **where needed** (not in parallel) and do not crowd out market developments. In this way the relevant **qualifying conditions** can be met.

[77] Source: Guide to broadband investment, European Commission

The choice of investment model for a given digital infrastructure programme is **determined by several criteria**. The key is to define sustainable investment models that foster competition, give all operators the same opportunity to participate in the development programme, and ensure access to open, affordable, high-quality and future-proof infrastructure and services. Ensuring that end-users have long-term access to high-speed infocommunications networks capable of delivering advanced services and applications is of paramount importance. The willingness of the private sector to develop in less developed cities, urban areas and rural, sparsely populated areas is crucial. Third, the amount and cost-effective use of national and EU funds available for broadband development.

Taking into account the described support schemes and the scale and success of self-sustained deployments to date, *a model of operator support* could be implemented in the development of residential VHCN networks. As part of the aid, a non-repayable grant scheme is proposed in the intervention areas, which may be complemented by a repayable grant. According to our proposal GINOP-3.4.1-20 scheme[78] aid rates, financing model and its implementation in practice are appropriate in general, with regard to eligibility criteria and investment costs.

In developing networks for government and schools, it seems appropriate to use the public sector-led municipal network model, as it was the case in the 2014-2020 programming period.

The **model was chosen** taking into account the experiences from domestic network developments, the results of EU-funded developments and economic considerations, which are mainly:

- to minimise disruption to the well-functioning domestic competitive telecommunications market, which is in a state of "fierce competition
- therefore, in line with EU state aid rules, only "VHCN white" sites and "optically inaccessible municipalities" in terms of uplink network were focused on
- the experience of previous projects (GVOP 4.4.1, 4.4.2), which also supported municipal participation, showed that it is more worthwhile to directly encourage telecommunications operators to develop, because in the end the telecommunications assets created will go to them anyway,
- development with or complemented by social cooperation is not viable in Hungary,
- what remains is targeted support for the coverage of backward, remote farms and other rural areas in the form of gap financing, based on calculations of a business model almost identical to those used by market operators.

Models used in the framework of the SZIP (mainly operator support) experiences:

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[78] For more information on the funding arrangements for the scheme, see the link below: https://www.palyazat.gov.hu/fhd-5712-ginop-341-20-jgenercis-nga-s-felhord-hlzatok-fejlesztse-2-tem Date of download: 08/09/2022

- There are hundreds of telecommunications service providers in Hungary, any of which could have participated in the tender,
- the large number of players has allowed competition to be created, thus optimising investment and aid amounts,
- the model has significantly increased coverage,
- the possibility of competition between providers has been opened up by the mandatory provision of open access capacity.

Possibilities for further development of the model:

- 5G/Gigabit: first of all, the infrastructure survey (ISM'20, ISM'21) should be extended to include passive infrastructure data from mobile operators, the location and height of towers, the total and spare capacity of optical fibre cables, and the location and machine room characteristics of mobile telecom nodes. On the public side, the tenderer can plan the passive fibre network gaps on the basis of the extended ISM database, converging both fixed and mobile technologies, optimised for the national economy.
- In spite of all previous targeted uplink network tenders (GVOP 4.4.1, GOP 3.1.2, GINOP 3.4.1), 1800 of Hungary's 3200 or so municipalities, even if they are connected by fibre optic cable, do not have capacity for 5G, gigabit development, new market entrants or effective competitors! This gap is essential for VHCN and 5G deployments and is the first to be filled, because without capacity to carry aggregated local network traffic or traffic collected at mobile base stations to backbone networks, coverage of end points (households, business premises, public institutions) is meaningless.
- It is particularly important to take into account that 5G networks require significant amounts of optical capacity. Consequently, the Gigabit 2030 programme should also support the necessary fibre capacity for 5G, i.e. the call for proposals should reflect the complementary nature of the programme, as this will significantly reduce both the amount of support and the investment and later operational costs for operators.
- It is also important to address the problem of ensuring that the "Open Access" obligation can be properly enforced on the networks built with subsidies, i.e. to develop a model for how these networks can be shared efficiently in a way that ensures a good return for the operator investing in the network development, while allowing the eligible operator to compete properly on the shared network. In such areas, competition may be primarily service-based rather than infrastructure-based due to subsidised network development.

The experience of the SZIP shows that for residential developments, part of the funding (30-90%) has been provided by EU (reimbursable and non-reimbursable) and domestic sources through public support. This was supplemented by the beneficiaries' own resources, which were compulsory under the call for proposals for this purpose. No other EU or international funding has been used for the projects, but a number of resources will be available in the 2021-2027 period that were not previously available. This includes CEF2 and Invest EU.

In order to ensure the availability of fixed and wireless **digital infrastructure** with adequate service capacity and quality, this strategy proposes the following measures:

DI I. Developing Gigabit-capable networks *(set of measures)*

The measure name	DI I.1 Planning and implementation of the "Gigabit Hungary 2030" network development programme
Purpose and content of the measure	The aim of the measure is to plan and implement the national network development programme "Gigabit Hungary 2030" in order to ensure that by 2030, Internet connections with a symmetrical speed of at least 1 Gbps are available at all locations. The action should aim to reach 75/70/65% of residential/business/public premises by 2025, 95% of residential premises by 2030 and 100% of business and public premises by 2030 with internet access at 1 Gbps or more. **The main elements of the measure are:** • Serving next generation wired and wireless networks Developing **basic telecommunications infrastructure;** • Support in the form of tenders for **backbone, upstream (district) and local network development** in areas where the market is not self-developing; • **Operation of a Superfast Internet Programme Office, a network of Supervising Engineers and a Broadband Competence Office (BCO)** to support and monitor gigabit developments in the public sector • If the development is not carried out either under the tender, an analysis of the involvement of **state-owned enterprises**, including, if necessary, the involvement of financial instruments.

The measure name	DI I.2 General review of the telecommunications regulation (ECA)
Purpose and content of the measure	The measure aims at a general review of Act C of 2003 on electronic communications, based on the 8-10 yearly revision of the EU regulatory framework for communications. Since the EU telecoms regulatory framework was liberalised around 20 years ago, Member States review it every 8-10 years and adopt major amendments to the Directive. In this context, Directive 2018/1972/EU establishing the European Electronic Communications Code was adopted at the end of 2018, and Hungary transposed it into Act C of 2003 on electronic communications in 2020. During the 10-year period of the Strategy, it is expected that there will be another such revision at EU level, which will then need to be implemented again into national law. In addition, there is a continuous need to monitor and, if necessary, revise the regulation (the ECA and the competition rules for the telecommunications market) on the basis of practical experience, in order to better support the policy and economic policy objectives of digitalisation, and micro and macro competitiveness. **The main elements of the measure are:**

	• Facilitating access to the physical infrastructure of **public enterprises**;
	• Review and, if necessary, amend the **rules on the construction of communications structures** (in particular the ECA and the CA);
	• Considering the use of so-called **soft law instruments** for accessibility (e.g. to strengthen the willingness of electricity suppliers to cooperate or cooperation between stakeholders).

The measure name	**DI I.3 Upgrading of the national standardisation body for the deployment of electronic communications networks**
Purpose and content of the measure	The aim of the measure is to encourage and simplify developments in this field by modernising the national standards for the deployment of electronic communications networks. For the successful, modern and cost-effective deployment of 5G/6G networks, regulatory intervention at the standardisation level of technical regulation is also essential. Among the standards, national standards are not sufficiently maintained by market self-regulation processes in Hungary, this part of the set of standards for the deployment of electronic communications networks is outdated, inconsistent with existing legislation in several areas and does not support efficient and consolidated deployment of infrastructure (e.g. co-deployment of other utilities and communications substations), which ultimately makes investments significantly more expensive, therefore the set of standards for the deployment of electronic communications networks needs to be updated. **The main elements of the measure are:** • Upgrading of around 20 **purely national standards**; • Proofread translations of some **40 standards** and their **introduction in** Hungarian (currently only available in foreign languages, with translation of the title).

The measure name	**DI I.4 Establishment of a register of sub- and building-blocks to support tendering for the development of a communications network, including gigabit-capable networks**
Purpose and content of the measure	The availability of a very high capacity and high-quality digital communication infrastructure is essential to provide efficient and modern digital services. In order to efficiently manage tendering to support the financing of further improvements in communications infrastructure, it is advisable to create a geo-spatial registry system to support tendering for fixed and wireless communications networks.

The main elements of the measure are:

- Establish a data environment in which all infrastructure owners (utility providers, other non-service infrastructure owners/operators) are obliged to provide data with a given technical content for all their network assets;

- Create a sub- and superstructure registry that is capable of storing and analysing network infrastructure elements;

- Establishing a one-stop shop for information, in line with the conclusions of the EU Telecoms Council and the recommendations of the European Commission, to facilitate and improve the development of communications networks

DI II. Digital infrastructure development for public education, higher education, vocational and adult education, research networks and public collections *(set of measures)*

The measure name	**DI II.1 A Geographical extension of digital infrastructure of institutions of public education, higher education, vocational and adult education, research networks and public collections, connection of district headquarters, municipalities, capacity building and connection of institutions**
Purpose and content of the measure	The aim of the measure is to develop and increase the capacity (taking into account redundancy) of the digital infrastructure of public education, higher education, vocational and adult education, research networks and public collections institutions, so that network users (e.g. public education and vocational training institutions) can connect to the backbone network at the closest possible point using a short backbone network. By developing the public network, market exposure can be reduced and cost savings can be achieved in the managed network. Thanks to the development, the continuous increase in demand for bandwidth will not lead to an unjustified increase in costs. **The main elements of the measure are:** • Create a **traffic hub** in the pedestrian hubs; • Network probe development, **active traffic monitoring** to increase availability; • Improve the **network monitoring system** to detect and locate faults more quickly and speed up intervention. This results in higher availability and more cost-effective operations; • **Improving traffic management** to achieve the most optimal network traffic; • **Creating channels of 100 GBit/s or more** between backbone devices, increasing the throughput of the network. In order to fully and seamlessly serve the growing endpoint needs and the requirements of DOS, research and digitalisation of public collections, development is needed to ensure that a consistent service is provided across endpoints, regardless of their geographical location; • **Replacement of equipment** in order to increase capacity, including the purchase of more modern equipment, which can be monitored and operated in a more uniform and cost-effective manner; • Establish **connection points** at each of the sites concerned;

- Connecting endpoints to the network over a **dark fibre leased optical line**;

- Providing **pre-aggregation nodes**;

- Enabling **network** solutions **for research** (e.g. quantum communications);

- Implementation of a **digital education network and application platform**.

The measure name	**DI II.2 Deployment of managed WiFi network infrastructures in educational and community spaces in colleges of education and training**
Purpose and content of the measure	The measure aims to develop educational WiFi networks in public education and vocational training colleges. **The main elements of the measure are:** • Deployment of **centrally managed WiFi networks** available in classrooms, common areas and living rooms; • Design and development of **Eduroam and Guest** networks; • Designing, installing and setting up classrooms **for online group work** (smart TV, camera, microphone, etc.).

The measure name	**DI II.3 Geographically distributed data centres and the development of advanced geo-redundant and distributed load cloud infrastructures, and the further development of cloud infrastructure and content platforms supporting digital and distance learning**
Purpose and content of the measure	The aim of the action is to provide geo-redundant data centres and services to ensure continuity and resilience of service to education and training institutions and to provide the data centre for the necessary steps to enhance information and cyber security. This measure strongly supports the competence developments defined in the DK III set of measures. **The main elements of the measure are:** • **Machine room developments** in the capital and rural locations; • Creating **server and storage capacity** in data centres; • **Design** and deployment of the platform units **(server and storage)** in some locations, in order to consolidate the service, thereby increasing the quality of service and reducing the load on the network. The aim is to improve the quality of management, supervision and high availability; • **Developing a user interface** that can also manage applications and apps; • Developing systems and solutions to support **student and teacher mobility**;

	Further development of existing platforms and portals enabling efficient delivery of **digital content**; **Developing a complex IT solution** that supports digital, online collaboration, communication and task fulfilment between students, parents/guardians and institutions: Provides **online communication and collaboration platforms** for the student and parent/guardian; **It provides digital content** (textbooks, guides, media elements, etc.) for **use in public education and vocational training**, **which supports distance learning** and complements face-to-face teaching; **It allows** parents/guardians to **effectively monitor** and track **academic progress**; **It provides digital tools** for talent management, remedial education and tutoring activities.

The measure name	**DI II.4 Establishment of data warehouses and data repositories to effectively support national and international RDI cooperation**
Purpose and content of the measure	The aim of the action is to create a digital infrastructure and applications that ensure the proper storage, organisation and accessibility of research data assets. **The main elements of the measure are:** - Build storage and server capacity in geo-redundant **data centres** to ensure high availability and uptime; - Development of a **data repository** solution, content delivery to support research collaboration; - Develop a **user portal** for end-users that can effectively support national and international R&D collaborations; **Initiating supercomputing (HPC) developments and expanding existing infrastructure** to effectively support collaborations and manage data assets.

DI III. Further development of the National Telecommunications Backbone Network by expanding bandwidth, covering hitherto uncovered points of public institutions

The measure name	DI III.1 Extension of the National Telecommunications Backbone Network (NTG), bandwidth expansion and related network upgrades
Purpose and content of the measure	The measure aims at upgrading the network of in-patient health care facilities, penitentiary institutions and district locations without National Telecommunications Backbone Network (NTG) endpoints, that do not have an optical network. Another important objective is to ensure flexibility to meet significantly increased and rising bandwidth demands by increasing capacity. **The main elements of the measure are:** • Further development of the district **aggregation** network; • NTG backbone network **capacity expansion** (including NTG network capacity upgrades for government employees **working from home**); • Optical connectivity for **hospitals**; • Optical connectivity of **penitentiary** (BV) institutions; • **Other network and security improvements** needed to securely serve NTG connections.

DI IV. Further development of wireless communications for preparedness and defence organisations (PPDR)

The measure name	DI IV.1 Further development of wireless communications for preparedness and defence organisations

Purpose and content of the measure	The aim of the measure is to improve and accelerate the operational and service processes of law enforcement, defence, national security, disaster management and other (critical) emergency services by improving (data) communication within and between institutions.
	
	The main elements of the measure are:
	
	• For the period 2022-2024
	
	   • phase I of **the deployment of** a new Broadband Emergency **Mobile Telecommunications Network**, and
	
	   • equipping the **emergency services** with broadband data communications equipment.
	
	• For the period 2025-2027
	
	   • **phase II of the deployment of** the Emergency **Mobile Telecommunications Network**,
	
	   • modernisation of the **Monitoring and Public Alarm System and Radiological Telemetry Network** (MoLaRi and RTH), and
	
	   • Developing **operations control** centres.

DI V. Expanding super computing (HPC) capacity to serve SMEs, research networks and public institutions *(set of measures)*

The measure name	DI V.1 Upgrading the domestic central HPC infrastructure to 15 Pflop
Purpose and content of the measure	The measure aims to meet the growing domestic HPC needs and to strengthen the international competitiveness of the domestic infrastructure. **The main elements of the measure are:** • **Deployment of** a new **HPC infrastructure**, expanded to 15 Pflops, with the latest technology available at the time of development; • **Building** an HPC **machine room, creating a machine room environment** to accommodate the new infrastructure and ensure its safe operation; • Developing a **software environment** that can support the activities and growing tasks of the Service Centre and interoperate with the systems established under DI II.3 and DI II.4 to support the full research lifecycle.

The measure name	DI V.2 HPC Competence Centre service development and operation
Purpose and content of the measure	The **objective of** the action **is to** develop a portfolio of support services and a competence centre to facilitate the efficient use of HPC infrastructure. **The main elements of the measure are:** • Increasing the capacity of the existing **HPC Competence Centre** to be able to handle the increased number of users at an adequate level; • **Development and introduction of new services** in HPC Competence Centre, by improving the quality of service.

DI VI. Encouraging the development of new generation mobile networks *(group of measures)*

The measure name	DI VI.1 5G Strengthen and expand the activities of the Coalition, conclude strategic agreements
Purpose and content of the measure	It also aims to expand the dialogue between industry, science and public authorities and to strengthen cooperation through new strategic agreements. In order for Hungary to be at the forefront of 5G deployment and take-up, it is crucial that the 5G Coalition, representing the 5G ecosystem, play an active role in 5G socialisation, building partnerships with verticals, international knowledge transfer, testing 5G-based innovations and creating optimal network deployment models. The 5G Coalition's competences should be further extended towards 6G over time. **The main elements of the measure are:** • **Expand the activities of** the 5G Coalition; • Prepare, **conclude** and operate **strategic agreements** between operators and government to accelerate state-of-the-art fixed and mobile and convergent technology developments.

The measure name	DI VI.2 Develop and launch 5G pilot projects

Purpose and content of the measure	The aim of the measure is to develop use cases through 5G pilot projects that will give Hungary a competitive advantage in the field.
	
	The main elements of the measure are:
	
	• **5G pilot projects** with the following focus:
	  • Road transport, self-driving vehicles;
	  • Infrastructure development of sports facilities (enhancing the spectator experience, TV coverage, support for competition management);
	  • Agricultural use;
	  • Industrial pilots;
	  • Health;
	  • Drone developments.

The measure name	DI VI.3 Development of 5G Centre of Excellence
Purpose and content of the measure	The objective of the action is to stimulate the development and use of 5G and related advanced telecommunication technologies, and to create and develop an ICT R&D ecosystem (in line with actions DI VI.1 and DI VI.2). **The main elements of the measure are:** • **Promote the use of 5G and related wireless technologies**, with a focus on the domestic SME sector, in cooperation with telecom operators. This will be based on 5G R&D, **development** and implementation of **use-cases and pilots**, mainly for industrial use; • The Centre **will provide test, demonstration and training environments** for SMEs and the use of autonomous collaboration systems. They are a good way to promote 5G and other related new technologies and to increase social acceptance; • The Centre will address **sporting, environmental, waste management and agricultural topics**; • It is also important to **create** the right **regulatory and standardisation environment** and to **ensure the supply of** 5G and related technologies **professionals**, as well as the development of training; • The Centre will **also carry out preliminary analyses** on **6G technology**, thus preparing the ground for Hungarian involvement in this technology.

The measure name	DI VI.4 Contributing to the development of EU 5G corridors
Purpose and content of the measure	The action aims to develop a high-performance 5G infrastructure to enable European citizens and businesses to fully benefit from free movement and the single market in an interconnected and integrated European Union. **The main elements of the measure are:** The measure will support **the development of 5G corridors** along major transport routes. Hungary is covered by the following two CEF2 Digital eligible **5G corridors**, where dedicated funding is needed to support the development of optical networks, antenna infrastructure and active equipment: • the **Mediterranean corridor** (Budapest - Zagreb - Ljubljana/Rijeka/Split - quasi along the M7 motorway); • the **Rhine-Danube corridor** (Frankfurt - Passau - Vienna - Budapest - Bucharest - Constanta - quasi along the M1 and M5 motorways).

The measure name	DI VI.5 Conduct health and environmental research related to 5G mobile technology
Purpose and content of the measure	The measure aims to objectively demonstrate the environmental and health impacts of technology through scientific research. **The main elements of the measure are:** Designing a **health and environmental impact assessment** and in-depth assessment of 5G impacts in **7 focus areas:** • Changes in environmental and public exposure following the introduction of 5G; • Genotoxicological and cell biological studies; • Neuropsychological studies; • Health assessment of the sub-terahertz spectrum of 6G systems • Environmental and ecological studies; • Development of experimental tools, dosimetric modelling (cross-thematic focus); • Communicating the results of the research project.

5.3. Digital competence

Developing digital skills and reducing the digital divide, and encouraging regular internet users to become ICT-aware, is **one of the key challenges for the digital ecosystem - whether** in terms of competitiveness, employment policy or equal opportunities. The **employability of workers** who do not use digital tools and applications is declining day by day, as is the **competitiveness of businesses** that remain digitally excluded. Digital literacy also enables the acquisition of other key competences that are essential for modern citizenship.

The conscious, publicly coordinated and supported development of digital literacy **has a positive impact on competitiveness and employment** at the level of citizens, businesses and public administrations and contributes to macroeconomic growth and equal opportunities.

These positive effects are further reinforced by the spill-over positive effects of ICT services use, i.e. its enabler nature, which provides a multiplier effect for the development of ICT skills and thus has a **positive impact on the overall national economy**.

An important element is to protect young people from the risks of the internet, to prepare children, their parents and teachers to use the internet in a conscious and value-creating way, and to enforce rules and measures to protect children more than ever before.

At the level of interventions, the development of digital skills is difficult to separate from the former **Connectivity** dimension**,** which is no longer included as a separate dimension in the DESI from 2021, however, some of its indicators complement the human capital indicators. The development of digital skills has a clear positive impact on the indicators now available in the Key Indicators, therefore, by improving both the human capital dimension and the indicators of Internet use, spectacular results could be achieved both in the DESI values and in the functioning of the Hungarian digital ecosystem.

In particular, the following gaps require particular attention, **according to the situation assessment**:

- **awareness of** adult learning programmes **is low and participation is poor**;

- low **awareness of digital literacy programmes** and low number of participants;

- to continue the ongoing improvements of the recent past, **it is necessary to increase the number of modern digital devices** in educational institutions, and it **is recommended to replace outdated devices**;

- the digitalisation of the workplace is happening **faster** than digital workforce training;

- the **conscious use of ICT,** strengthening cyber security aspects is a priority;

- there is a quantitative and qualitative shortage of higher-skilled **IT professionals in the labour market**;

- **the slowdown in ICT developments in** public education, vocational training and higher education institutions can cause **labour market disadvantages** and competitiveness problems for individuals, businesses and the state;

- the training of teachers and the continuous development of IT tools are essential in public education.

National and international experience indicates that:

- only systematic interventions, **locally implemented but nationally coordinated integrated programmes and human networks, and** a complex approach to all dimensions of lagging can achieve meaningful results in catching up;

- those without basic digital skills cannot be persuaded to take part in training courses or to acquire skills that **they themselves do not perceive as lacking or necessary**;

- a successful programme can only be **based on the real needs of the target group**, because only then can they be expected to make their own efforts to become digitally literate;

- taking into account the diversity and evolution of real needs over time: making the digital world attractive to all, with offers tailored to their **specific life situation**;

- to develop the digital competences of citizens living in disadvantaged areas and/or those who are not involved in the digital world due to lack of interest or financial resources, it is essential to provide them with **ongoing local support**, not just one-off training programmes;

- successful programmes that attracted large crowds were always **based on** some kind of **central network**, while at the same time the target group members were in contact with opinion formers and people and organisations with a local community embeddedness;

- the importance of "**within the family" (small community) programmes** is that they involve a member of the family (small community) with IT skills bridging the digital divide, which is one of the most effective incentives.

Measures proposed to continuously improve the digital competences of the population and the digital skills of workers:

DK I. Launching digital literacy programmes for the general public based on DigKomp *(set of measures):*

The measure name	DK I.1 Rapid and systematic implementation of the DigKomp system
Purpose and content of the measure	The aim of the action is to systematically build and develop citizens' digital literacy by introducing the DigKomp System and Toolkit, in line with the European Citizenship Digital Competence Framework, to overcome competitiveness, employment and opportunity gaps. **The main elements of the measure are:** • Developing, implementing and operating DigKomp civic digital competence **reference framework;** • Creation of a **learning support platform**, development and operation of a task bank; • Creation and operation of a **training register** to record and validate the quality of DigKomp training; • Conducting a **dissemination and marketing campaign** for the DigKomp System; • **To provide** professional and methodological support, further development, **quality assurance, monitoring and evaluation of** digital competence development.

The measure name	DK I.2 Strengthening digital inclusion through services, targeted awareness and education programmes
Purpose and content of the measure	The aim of the measure is to support the social inclusion and integration of vulnerable social groups through digitalisation, and to systematically raise awareness of digital skills among those who are excluded from the digital world, with a particular focus on marginalised and disadvantaged social groups (people living in extreme poverty, Roma, elderly people living alone in rural areas). The measure aims to reach out to, motivate, assist and empower people from vulnerable social groups. **The main elements of the measure are:** • **Expand** and further develop **the network of** Digital Community **Points**; • Developing and implementing a tailored and integrated programme (campaigns, motivation and communication programmes) to persuade those who are **refusing the digital world for whatever reason**; • Organising and coordinating **programmes** to encourage and raise awareness of the use of media and ICT tools among the target group;

- Developing services adapted to the skills and life situation of the target group to facilitate their participation in **DigKomp-based digital literacy development**;

- Raising awareness and demand for digital literacy among disadvantaged citizens;

- Ensuring equal access to digitalisation to reduce the generation gap;

- **Raising awareness of ICT use, with** a strong cyber security focus in the programmes;

- Providing the background and support network needed to develop the digital skills of the population, and to support individuals' digital lives and improve their quality of life;

- Developing motivational and methodological materials and programmes that contribute to the promotion of Internet awareness.

The measure name	**DK I.3 Launching digital literacy programmes for the public (DigKomp 1-6)**
Purpose and content of the measure	The action aims to reduce the digital divide for citizens, workers and, in particular, for disadvantaged groups in society. **The main elements of the measure are:** • Support for the acquisition of DigKomp basic digital skills, levels 1-3, **through a voucher scheme**, in the form of attendance courses for all 16-74 year olds in accredited institutions, organisations and organisations for the teaching of DigKomp level 1; • Support for the acquisition of DigKomp advanced level, 4-6 digital skills through a **voucher scheme**, in the form of accredited adult education institutions, organisations and online courses for higher levels of DigKomp, with mentoring, for the whole 16-74 age group; • Higher levels of civic and entrepreneurial competence development, support and mentoring, using DigKomp-based solutions. • **Further development of the evaluation** system and the **certification system**; • Deliver basic and introductory digital skills training programmes for people without digital skills and citizens with disabilities. • **Artificial intelligence education** - **training** and related transformative projects, supporting the development of coding and algorithmisation as basic skills for the **population**.

	• To prepare education, skills development and society to seize the opportunities offered by AI, to become users of the technology, and to raise awareness of the benefits and risks of its use.

Name of the measure	DK I.4 e-Health (access to health care services) competence development in public services, care, population in school and other training systems
Purpose and content of the measure	The aim of the action is to increase the digital literacy of healthcare workers and improve the e-health skills of the population to improve the efficiency of care processes. **The main elements of the measure are:** • **Delivering training** on e-Health to support citizens' digital inclusion, • Professional training for staff of state and municipal health care providers on the integration of the **National e-Health Infrastructure (EESZT).**

The measure name	DK I.5 Involving senior citizens in the digital society, age management programme
Purpose and content of the measure	The aim of the measure is to involve older people in the information society, thereby improving their lifestyle and raising their standard of living The highest proportion of active older people over 65 years of age who have not yet been able to take advantage of the opportunities offered by digitalisation due to a lack of infocommunication skills. **The main elements of the measure are:** • Development and implementation of **a digital competence development programme** tailored to the life situation and interests of older people; training of a mentor network to organise and deliver competence development programmes for older people, providing mentoring, tutoring and consulting support; • **Sensitising older people** to digital financial services that do not require personal presence, providing educational content and mentoring; • Establishment of a nationwide **remote monitoring system** for citizens (elderly or chronically ill people) in need of social assistance in their own homes, **using smart devices**

DK II.   Increasing the availability of IT professionals and digitally literate workers *(set of measures)*

The measure name	DK II.1 Increase the number of enrolments and graduates in tertiary IT and digitalisation education
Purpose and content of the measure	The measure aims to reduce the significant and growing digital skills shortage in the labour market by increasing the number of people (especially girls and women) entering interdisciplinary training programmes in IT and IT or digitally-included fields, and reducing the drop-out rate. **The main elements of the measure are:** • Evaluation of the experiences of **Program Your Future!** (GINOP-3.1.1-VEKOP) further development and extension of the programme; • Continuous monitoring of the **labour market demand** for IT professions and digitally literate professionals, social awareness raising, and identification of mismatches between labour market demand and training supply; • Initiating and supporting new interdisciplinary and dual **training courses, traineeships;** • Launching targeted programmes to promote IT careers, to promote career paths and reduce drop-outs, **communication and motivation activities** reaching out to young people (especially girls), parents and teachers; • Establish and operate **digital experience centres for the public** in each county).

The measure name	DK II.2 Support for IT and digitalisation training in vocational and adult education and training to meet labour market needs
Purpose and content of the measure	The measure aims at significantly increasing the number of IT and digital professionals studying outside the higher education system (in vocational education and training or in short cycle adult education). **The main elements of the measure are:** • Review, prepare and implement the development of the **IT vocational training** system; • **Continuous monitoring** and social sensitisation of the **labour market demand** for skilled IT workers and digitally literate professionals, and identification of mismatches between labour market demand and training supply; • For **non-IT professions**, expanding the digital and online content of teaching materials and training, developing digital workshops,

	and developing interdisciplinary teaching materials;
	• To systematise, make transparent and promote **short-cycle IT and digital (online) training** (market and public programmes); • **Support for corporate training in** IT and digitalisation (e.g. by making it deductible from the vocational training contribution); • Targeted **training of** persons **with specific expertise** (e.g. forensic experts, notaries, etc.) to assess **digital concepts and phenomena** (e.g. cryptocurrency transactions, proof of online identification, etc.).

DK III. Strengthening the development of digital literacy in public education, vocational training and higher education *(set of measures)*

The measure name	DK III.1 Development of digital pedagogical methodologies and training
Purpose and content of the measure	The aim of the measure is to provide professional support for the digital transformation of education and training, and to create a scientific and professional base for digital innovation, development, knowledge management and monitoring in education, reinforcing the **Public Education Strategy**. **The main elements of the measure are:** • **Mapping of** international and national **digital professional innovations,** testing their applicability, development of targeted methodological training; • To **support digital methodology training** for teachers at home and abroad, in order to establish direct contact and actively work with teachers at home and abroad; • To **examine educational technological innovations in particular and analyse the possibilities of their adaptation** in the Hungarian educational system (in particular machine learning-supported educational administration and AI-based solutions supporting pedagogical functions); • **Digital content and service development** to improve the quality, effectiveness and labour market relevance of education and training systems, as set out in the Public Education Strategy; to improve the international visibility and market access of successful Hungarian developments, good practices, programmes and professional know-how; • **Data-driven analysis and monitoring of** international trends and domestic processes and innovations, developments, **policies** related to **21st century digital education** and digital switch-over, facilitating participation in EU educational developments and projects.

The measure name	DK III.2 Digital tools, services, content and competence development for 21st century public education and training

Purpose and content of the measure	The aim of the measure, reinforcing the **Public Education Strategy,** is to ensure that the tools of the appropriate technological level and the teachers who are able to use them at the appropriate level of proficiency and are familiar with digital pedagogical methodologies are available in the public education and vocational training system for the introduction of the DigKomp-based digital pedagogical methodologies to be developed within the framework of intervention DK III.1. This is a prerequisite for ensuring that students leaving the education system have the necessary digital competences (defined in a uniform way according to DigKomp), providing them with the digital skills they need for further learning and employment,

and to ensure their adaptability and competitiveness in the labour market.

The main elements of the measure are:

- **Assessment of the digital assets of** public education and vocational training institutions, identification of development needs, implementation of the necessary improvements;

- Ensuring a **consistent approach to the operation of** existing and acquired **assets**, providing ongoing support and support for administrator services;

- Supporting the further development of **educational platforms and software** that support both classroom and distance learning environments **(hybrid)**, enabling a smooth transition to distance learning, so that teachers and students can participate in the teaching-learning process using their own (or school) devices, whether at home or in the classroom;

- Support for digital **workshops, programming courses** (tool vouchers, travel support, targeted support for preparation for competitions);

- Systematic assessment of teachers' **digital competences**, identification of development needs and launching of competence development programmes;

- (Further) development and operation of programmes (training courses, knowledge-sharing platforms, workshops, lectures, webinars, publications, video channels, etc.) aimed at reaching a wide range of teachers to learn **digital pedagogical methodologies**;

- launching a **"Digital Teaching Assistant" programme** to involve senior students interested in IT and digitalisation in supporting digital pedagogical solutions;

- Developing central **digital content and services**, primarily to provide and maintain digital learning material and content in line with the renewed content regulation;

- Accelerating **the digitalisation of learning materials**;

- Knowledge sharing solutions and **learning management environment**
development;

- Developing a **digital support system** that helps to reduce the administrative burden and processes in schools (e.g.: online payment system; catering information), while allowing educational institutions to optimise their teaching schedules;

	- Creating a complex IT solution that supports digital, online collaboration, communication and task fulfilment between students, parents and guardians, and institutions; - Developing an **IT system to** support students' **career guidance**, supporting lifelong learning, outlining possible career paths, based on competency assessment. It also helps the student to adapt to the new situation, linking the student, school and the apprenticeship or workplace, e.g. in dual training.

The measure name	DK III.3 Digital programmes to support labour market, Industry 4.0 and agri-digitalisation adaptation in vocational education and training, higher education and adult education
Purpose and content of the measure	The aim is to ensure that the vocational education and training, higher education and adult education systems provide a complex way of acquiring the digital competences and professional skills required by modern production solutions (e.g. Industry 4.0, industrial automation and robotisation, precision agriculture, etc.) and training of trainers. **The main elements of the measure are:** - Assessment of the assets of the institutions concerned, identification of development needs, **development of workshops, laboratories, experiential centres** suitable for the demonstration of Industry 4.0 solutions (robotics, automation, AI, etc.); - Systematic assessment of the high level of digital **competence** among teachers and trainers of the institutions concerned, identification of development needs and development in line with Industry 4.0 requirements (training courses, knowledge-sharing platforms, curriculum development, workshops, lectures, webinars, publications, video channels, etc.); - Establishing Industry 4.0 **competence centres** at universities, Industry 4.0 workshops in the Vocational Training Centres; - Developing digital competences and professional knowledge of agricultural digitalisation for students **in vocational training in agriculture** and agricultural producers.

The measure name	DK III.4 Digitalisation development supporting sectoral management of higher education

Purpose and content of the measure	The purpose of the call is to provide the IT systems necessary for the performance of the higher education sector management tasks specified in Section 64 (1) of the Act on National Higher Education. The aim of the call is to implement the provisions of Act No. Within the framework of the priority project, the development of the data assets and data systems necessary for the sectoral governance of higher education will be carried out in order to facilitate evidence-based decision making.
	The data domains concerned with development are data on sectoral asset management, performance and quality funding, training organisation, infrastructure, RDI capacity, digital readiness, mobility abroad and human resources available.

In addition, the data systems managed by the Education Office (e.g. admissions, higher education institution data collection, graduate career tracking) need to be restructured, modernised and adapted to the changed sector management tasks, which better reflect the needs and expectations of both higher education institutions and students, and are also adapted to 21st century digital solutions.

The main elements of the measure are:

- the preparation of an inventory of higher education data assets

- development of a data asset management methodology and training for sector management, funding bodies and higher education institutions

- the creation of a methodological centre for higher education data assets (to create continuity in sectoral data provision)

- developing thematic, goal-oriented interfaces;

- editing and managing an information web interface

- FIR and further development of the Higher Education Analytical Data Warehouse

- Further development of the Graduate Career Tracking System

- improvements related to the higher education admission process

5.4. Digital economy

The IVSZ study on measuring the weight of the digital economy in the national economy, cited earlier, clearly shows the **competitiveness effects of new technologies**;

- according to research based on an analysis of the multiplier effects (based on the GVA) of the ICT sector, the gross value added (GVA) generated directly and indirectly by the ICT sector increased by more than 20% between 2014 and 2019, to HUF 6 thousand billion, which means that the sector **accounts for around 20% of total Hungarian GVA**, including multiplier effects;

- the ICT sector provides employment for **17% of the workforce**, taking into account multiplier effects; the share of people employed in the digital economy is even higher, certainly above 20%;

- the **ICT sector is the second largest exporter to the economy** (after the automotive sector), accounting for 8.7% of total exports in 2019, a similar performance to agriculture and food combined;

- a **technology-driven scenario** based on the rapid adoption of new technologies (5G, IoT, AI, blockchain, etc.) is projected to **generate an annual GDP gain of almost HUF 4 thousand billion** (and a tax gain of HUF 1 800 billion) by **2023** compared to the organic path;

However, while the digital economy represents a high share of the Hungarian national economy in an international comparison, mainly due to its high export share, the **Hungarian digital ecosystem is performing below average in an international comparison**. Within this, Hungary performs poorly in the DESI dimension of "technology integration" reflecting the use of digital technologies by businesses; we are last in terms of the share of businesses that improve the efficiency of their internal operations **through electronic information exchange**, and 22nd in terms of the **use of big data**. There is a lag in the uptake of **cloud services** (21% vs 34%) and the share of **SMEs selling online** (18% vs 18%) will only catch up with the EU average in 2021.

To realise the **historic potential of digitalisation**, it is essential that **digital developments are prioritised in government policy** and given **a weight commensurate with their competitiveness importance** in both domestic budget allocations and EU funding planning. In the case of the digital economy, this **means** in particular launching programmes to increase the **digital readiness of** domestic **micro, small and medium-sized enterprises**, accelerating sectoral digitalisation and **stimulating and supporting** digital upgrading, innovation and export performance of domestic businesses (ICT and other).

Today, there is no question that digitalisation is the engine of the economy and is having an impact in **all sectors**. Today, immature technologies and business models are becoming widespread, with 5G, IoT, Big Data, Artificial Intelligence (AI), the sharing economy fundamentally reshaping entire sectors from agriculture to transport.

In order to achieve the vision set out in the objectives of this strategy, **it is essential to address the weaknesses and challenges identified in the situation analysis**, in particular the following:

- **micro-enterprises**, the most numerous segment of entrepreneurs, are the **least digitally ready** and have had access to relatively few development policy programmes;

- In **some sectors** (tourism, construction, food, logistics, retail) **the digital divide is even larger than average**, largely due to the presence of a large number of micro and small enterprises;

- many **business leaders** are not open to new solutions and do not recognise the breakthrough potential of digitalisation, which will become a major cause of their loss of competitiveness;

- a large proportion of businesses, especially ICT businesses, **operate in** the **Central Hungary Region (KMR)**[79], but EU funding is typically only available in regions outside this region;

- **R&D&I resources that also support the development of ICT businesses** are not sufficiently available to the sector;

- **increasing the capacity of businesses to use data**, to be promoted by the public sector, especially in key domestic economic sectors **(such as agriculture)**

- the need to **further reduce the shortage of IT professionals**, both in terms of quality and quantity, without which the proper digitalisation of the economy (and the state) cannot be achieved.

In the digital economy, the following actions are needed:

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[79] From 2021-2027, Pest County will be a separate NUTS2 region from Budapest (also at programme level), therefore the

The concept of KMR has been eliminated, it will be eliminated, the development policy situation of the county may improve

DG I. Dedicated programmes to address areas where digital technologies are lagging behind in terms of integration inside and outside the company *(set of actions):*

The measure name	DG I.1 Increasing digital literacy and use by micro, small and medium-sized enterprises
The aim of the measure and its content	The aim of the measure is to further improve the digitalisation of Hungarian micro, small and medium-sized enterprises, the appropriate use of ICT tools and solutions, i.e. the integration of enterprises into the digital and data economy, thus increasing their competitiveness in all sectors and business segments. **The main elements of the measure are:** • The **extension of** the **Modern Business Programme** (MVP, GINOP 3.2.1), both in terms of target group (micro-enterprises), geographical coverage (Central Hungary region - Budapest and Pest county) and professional elements (e.g. artificial intelligence, Big Data services, cyber security, cloud-based solutions, IPAR4.0 developments, etc.); • Design and operation of new **services and platforms for digitalisation in** public **enterprises** • Preparing and implementing **sectoral digital** strategies and action plans; • National **communication campaign** to promote the digitalisation of micro-enterprises; • **Digital (online) advisory system for micro-enterprises** (MVP consultants in cooperation with DJP Points).

The measure name	DG I.2 Introduction of grants and new types of financing schemes (e.g. vouchers, guarantees) to support digitalisation in enterprises

Purpose and content of the measure	The aim of the measure is to provide simplified financing support for the digitalisation development of a large number of micro, small and medium-sized enterprises in all segments, in order to increase their competitiveness and strengthen their commitment to digitalisation. **The main elements of the measure are:** • Developing and launching fast and easy (almost automatic) **grant, voucher or loan-guarantee-based financing** opportunities that can be used by the businesses concerned for their small-scale digital developments, the introduction of new solutions and services; • **Encouraging the introduction of agri-digitalisation solutions** through a targeted support/financing programme.

The measure name	**DG I.3 Support for the digital transformation of industrial SMEs, Industry 4.0 Increase their preparedness**
Purpose and content of the measure	The aim of the measure is to support the development and deployment of hardware and digital tools and solutions related to new Industry 4.0 and Internet of Things (IoT) technologies that the companies concerned cannot implement on their own, thus helping the domestic manufacturing sector to move to a higher level of production in order to contribute more effectively to the economic value chain. **The main elements of the measure are:** • Analysis of the previous GINOP and national schemes with similar objectives, as well as the Modern Enterprises Programme and the Modern Sample Plants Programme, and the **processing of experience and incorporation of the results** into the design of new schemes; • Setting up of **Digital Learning Garden**(s) demonstrating **AI/INDUSTRY 4.0** technologies, in addition to demonstration and competence development objectives, by creating a production test environment and carrying out production sample projects; • **Supporting the implementation of** Industry 4.0, IoT and other advanced business digitalisation **solutions and systems** among domestic manufacturing SMEs through a call for proposals;

The measure name	DG I.4 Targeted programme to support the use of data by enterprises (SME big data programme)
Purpose and content of the measure	The aim of the measure is to encourage businesses to participate in the data economy in order to improve their operational efficiency and promote their business development. **The main elements of the measure are:** • Establishment of an **SME big data knowledge centre**, which will provide coordination, expertise, monitoring, certification, communication and test environment support to companies' data use, in cooperation with relevant government actors; • Designing and launching a targeted funding **programme** for big data development in companies, **based on a grant or voucher scheme**; • **Development of a decision support system service based on digitalisation and automation** (e.g. cloud, AI, machine learning), which can help micro, small and medium-sized enterprises to improve their competitiveness and develop their digital competences; • **Developing an HPC capacity platform and research-related system that can provide a link between the SME sector and the academic sector**, giving researchers a closer insight into the functioning,
	efficiency and strategic issues of different industrial actors and giving companies access to a broad academic knowledge base.

The measure name	DG I.5 Creating corporate digital experience and competence centres, technology spaces

Purpose and content of the measure	The aim is to create local and mobile business digital experience and competence centres that clearly demonstrate where and how digitalisation can transform and improve a business's operations and ability to grow.
	
	The main elements of the measure are:
	
	• **Supporting the creation of** corporate **digital showrooms, experience and competence centres** to be set up on the bases of entrepreneurial organisations, universities, professional organisations and other actors, with central coordination, by:
	
	   • Stationary and mobile showrooms capable of demonstrating digital, robotisation, automation, 5G, Artificial Intelligence, blockchain, etc;
	
	   • Workshops for SME managers;
	
	   • On-site advice, coaching;
	
	   • Professional events;
	
	   • Communication and other activities.

The measure name	DG I.6 Further development of the Integrated Business Portal
Purpose and content of the measure	The aim of the measure is to further develop the government-operated online platform for entrepreneurs (vali.hu portal), which is a mobile application for the one-stop shop for digital public administration services, other public services, development policy and business development services and market information for businesses. The services provided will result in the improvement and development of SMEs' productivity and digitalisation capabilities, contributing to the improvement of their competitiveness. **The main elements of the measure are:** • Expansion of the functions of the already established entrepreneur portal (vali.hu), development of a related mobile application; • Designing and delivering government information, advice and support services (e.g. resource maps, e-learning materials) to businesses;

	• To produce and publish easy-to-understand, practical handbooks and related support materials on digitalisation for SME business owners and managers.

Name of the measure	**DG I.7 Promoting the development and use of electronic transactions and fintech services**
Purpose and content of the measure	The aim of the measure is to increase the number of online transactions by exploiting the regulatory opportunities in the relationship between businesses, consumers and the state. **The main elements of the measure are:** • **Identifying development needs**: identifying online transactions that are available but have limited use by stakeholders, and identifying processes where online transactions have not yet been developed; • Identifying **barriers** to wider use, and implementing the necessary accessibility and possible **regulatory measures** (e.g. mandatory e-payment for businesses, legal accessibility of e-contracting, e-signatures or the digitisation of sector-specific documentation); • **Implementation of missing improvements** (e.g.APIs[80]for fintech or other services, or missing transaction development, including IT security issues); • **Effective communication** and promotion of accessibility, regulatory measures and existing and new developments.

Name of the measure	**DG I.8 Digital development of the domestic agricultural economy through targeted programmes**
Purpose and content of the measure	The aim of the measure is to provide farmers and other actors of the agricultural economy with the opportunity to learn and test digital technology, to acquire the necessary basic knowledge and to introduce digital tools and solutions (with a Carpathian Basin focus). **The main elements of the measure are:** • The **Digital Academy for Agriculture** will help the sector to become digitally aware by providing a knowledge base to support the digital transformation of agriculture, while ensuring,

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[80] API: Application Programming Interface: Application programming interface

to familiarise the actors of the agricultural economy with the available tools and solutions for agricultural digitalisation;

- To add digital skills to the knowledge base of the **agro-advisory system**, so that farmers can receive specific, personalised advice on how to plan and run their own farms gradually digitally, using the latest agricultural machinery, tools and technologies.

DG II. Targeted and innovative development of the ICT sector and ecosystem (set of actions)

The measure name	DG II.1 Support for digital start-ups
Purpose and content of the measure	The measure aims to effectively support the development and international market entry of domestic digital start-ups through a complex portfolio of services and support, contributing to the growth of digital exports. **The main elements of the measure are:** • Building on **the INPUT programme** (GINOP 3.1.3), which has been running since 2016, to implement a **national startup mentoring programme** to increase the knowledge and networking capital needed to bring the products of Hungarian digital startups to international markets and to develop cooperation between businesses; • **Evaluate** and review past and current **incubator and venture capital programmes**, and explore their possible expansion and continuation; • Explore related **fundraising and grant opportunities** for the firms concerned and make small (de minimis) grants available; • Specific mentoring and support for incentive programmes for start-ups developing **disruptive ICT technologies**.

The measure name	DG II.2 Launching dedicated RDI programmes for actors in the digital economy, based on the orientations / priorities identified in the S3 strategy
Purpose and content of the measure	The aim of the measure is to support the RDI activities of domestic ICT and other enterprises involved in the digital ecosystem at all stages through targeted calls for proposals and other funding schemes to increase the sector's R&D and innovation activity, based on the national economic and horizontal priorities identified in the Smart Specialisation Strategy (S3) 2021-2027.

The main elements of the measure are:

- **Evaluate** the previous period's **RDI proposals**, in particular the participation of ICT companies and the digital content of the winning proposals;

- Developing targeted **R&D and innovation support programmes** for businesses in the ICT sector and the digital economy to increase RDI activity in the sector;

- **Call for proposals for** grants, conditional grants, financial instruments (loans, equity, guarantees) or a combination of these, including for digital companies and other organisations, to stimulate their digitalisation-centric activities;

- The **creation of** a public innovation and **competence centre** to **support**, mentor and follow up on the implementation of proposals for **ICT businesses**.

The measure name	DG II.3 Increasing RDI, manufacturing and export capacity in the hardware and software industry

Purpose and content of the measure	The aim of the measure is to boost the performance and capacity of domestic digital businesses through targeted instruments, thereby increasing their contribution to GDP and exports.
	
	The main elements of the measure are:
	
	- **Targeted support** to domestic hardware and software development companies to increase their international competitiveness in specific priority technology areas (e.g. sensor technology, INDUSTRY 4.0, data mining and AI services, innovative SME solutions, cyber security certified ICT tools and solutions, etc.);
	
	- Identify and then implement **specific interventions** that could be considered:
	
	  - introducing new **tax** incentives (e.g. for RDI);
	
	  - **regulatory** measures (e.g. introduction of labour benefits);
	
	  - targeted **support and investment promotion** programmes;
	
	  - **export support** measures;
	
	- To attract additional hardware manufacturing and software development capacity to Hungary and create an **attractive investment environment** for businesses in the sector.

The measure name	DG II.4 Developing infrastructure and test environment for emerging digital technologies
Purpose and content of the measure	The aim of the measure is to stimulate the development and use of emerging innovative digital technologies (e.g. blockchain, drone, IoT, quantum computing) in Hungary by providing an appropriate infrastructure and test environment in line with the initiatives of Science Parks, National Laboratories and Higher Education Research Workshops. **The main elements of the measure are:** • Developing **interdisciplinary** open innovation centres with the infrastructure and pre-configured test environment needed to test new technologies and applications, primarily for **ICT companies** (including start-ups), but also for other companies, public administrations, research and higher education institutions; • **Establishment of higher education research workshops** supporting emerging digital technologies (drone, 5G, big data) **to stimulate R&D&I activities of domestic digital technology companies**; • **Develop centres of excellence** based on the innovation centres, drawing on the intellectual capacity of the businesses and research centres that operate and use them; • **Ensuring coordination** between centres, continuous monitoring and testing of operations; • Contribute to **additional regulation** where necessary; • Development of the **European Blockchain Service Infrastructure** (EBSI) nodes in the framework of the European Blockchain Partnership, expansion of the number of participants (e.g. universities, research centres, incubators), introduction of pilot services.

The measure name	DG II.5 Attracting international and corporate AI research and development centres to Hungary
Purpose and content of the measure	The aim of the measure is to make Hungary an attractive destination for foreign IT companies and organisations involved in the development of artificial intelligence, thereby indirectly boosting the performance of Hungarian digital businesses. **The main elements of the measure are:** • Domestic AI RDI organisations **strengthening its international relations**;

	• **Building** international trade and **research links** between Hungarian and foreign organisations engaged in AI-related RDI activities; • **Identification**, collection and structuring of domestic **AI capabilities**, **production of** English language **publications** in order to provide potential foreign partners with an easily understandable picture of the **capabilities and opportunities** in the domestic AI ecosystem; • **Targeted promotion of domestic AI capabilities** collected in a structured format to pre-defined foreign organisations.

DG III.   Economic use of public data assets
(group of measures)

There is a need to adequately assess, organise and regulate the national data assets through targeted and well-founded instruments, and to promote innovative re-use of data, except for proprietary data, with maximum attention to data protection. The task will pay particular attention to the cornerstones of EU legislation and the Data Policy White Paper:

The measure name	**DG III.1 Establishment of an Artificial Intelligence Innovation Centre**
Purpose and content of the measure	The aim of the measure is to stimulate the development and innovation of artificial intelligence and data-driven business applications, and to support their introduction and adoption by domestic enterprises. The AI centre will enable the targeted promotion of AI applications by SMEs playing a central role in the Hungarian economy, the development and maintenance of targeted SME-focused AI content, educational materials and training. The Centre will also identify opportunities for the development of AI-supported public administrations. **The main elements of the measure are:** • **Developing AI** and data-driven business intelligence **solutions**; • Support for SMEs wishing to adopt AI technology by providing **audit opportunities, certificates and consultants**; • Presentation for SMEs wishing to introduce AI technology **providing infrastructure and test environment** • Provision of artificial intelligence-based services **(MIaaS)** to public administrations.

The measure name	**DG III.2 Developing a comprehensive and general data governance and MI environment**

The aim of the measure and its content	The aim of the measure is to build a general data asset regulatory environment for the development of the domestic data economy, including support for the use of public data assets for MI purposes, and to support the development of a system of data assets, financial and legal regulation, taking into account the specificities, responsibilities and competences of each sector, public sector bodies and data owners, as well as fundamental rights and the international data regulatory framework.

The main elements of the measure are:

- Extending the tasks related to the exploitation of **public data assets;**

- Establishing appropriate **partnerships** with the main stakeholder organisations;

- **Continuous monitoring of** the European Union **rules and other regulations** (including developments in case law and jurisprudence) affecting the data economy, involvement in the regulatory preparation processes, and the efficient and rapid transmission of new rules and interpretations to Hungarian law, including the transposition and application of the EU Directive (EU) 2019/1024 on Open Data and the re-use of public sector information (the so-called Open Data Directive or the new PSI Directive);

- **Establish MI registers** to set expectations in priority areas;

- **Use of information from the data assets, implementation of data-driven public administration**, data cleansing for the use of AI;

- Delimitation of responsibilities, **industry rules, developments** continued support for;

- Developing an **MI code of ethics**;

- Creating a **framework law on data assets**;

- Data that allows the appropriation and use of data for MI purposes
  creating a sector-specific regulatory environment;

- **Establishing a set of rules for the use of public data**, and developing a concept and rules for their appropriation;

- Transforming the **public data use model**;

- Creating **a data repository**.

The measure name	DG III.3 Creating an agricultural data economy
The aim of the measure and its content	The aim of the measure is to create a public and other service environment enabling the use of modern precision, data-based technologies to ensure the profitability and surplus income of domestic agricultural producers. **The main elements of the measure are:** • The introduction of an **open meteorological data policy** by making meteorological data and information from the National Meteorological Service that can be used in agricultural production available to farmers free of charge; • The implementation of an **open agricultural spatial data policy** through the development of the Agricultural Parcel Identification System (MePAR); • The introduction of an **open precision positioning service** by upgrading and expanding the satellite positioning service and reference station network (GNSS) and extending the availability of the positioning service by making it free of charge; • Developing an **open agricultural administrative data policy** and improving the standardisation and digitalisation of soil data (Soilweb); • Conceptual underpinning of **data collection** (remote sensing, drones, sensors) and processing in **agriculture** to inform decision support; • Extending **the availability of** identification and performance testing **data** in **the livestock** sector (structured access to ENAR, TIR, OLIR, BIR, SZIR specialised systems); • Developing a system capable of aggregating and facilitating the flow of information on meteorological and other environmental data to support decisions affecting specific sectors (e.g. agriculture).

The **network of European Digital Innovation Hubs (EDIHs) and** the new direct EU funding source, the **Digital Europe Programme** and its tenders, will play an important role in achieving the goals of the Digital Economy pillar and the above actions, but also in the other pillars. EDIHs are intermediary, coordinating and advisory organisations that connect actors involved in the digital economy (and society), such as businesses, IT vendors, start-ups, financial institutions, universities, education and training institutions, research centres and public institutions. The network of EDIHs is (also) being developed in Hungary.

5.5. Digital state

The digital state means both

- central, regional and local public administrations and public service institutions **capable of making their own operations more efficient** using digital technologies (e.g. health, education, libraries, cultural heritage or for sharing public data and information assets), and

- making public **services** (public administration, health, etc.) available on a digital platform for **citizens and businesses**, and making it possible to do business online.

So far, the **focus of digital public administration development in** Hungary has **typically** been on improvements aimed at **making internal processes more efficient**, which has translated into less visible but extremely costly improvements. Nevertheless, further progress is needed in this area to improve the efficiency of public administration.

At the same time, there have also been major improvements to the customer site to **move the most common transactions to a digital platform**. A significant part of the mentioned developments improved the quality and user-focus of the client-side services, such as the renewed Magyarorszag.hu (SZÜF) with its integrated solutions (e.g. iFORM form support), the municipal ASP electronic administration portal (e-Government Portal), the Police online administration portal, the eSZJA service of the NAV, EESZT residential portal.

It is important to underline that the **COVID-19 epidemic** in Hungary in March 2020 proved that **digitalisation was effective in ensuring** the **functioning of the state** in radically changed circumstances, thus reducing the economic downturn caused by the epidemic; e-government services **ensured citizen access to** the most important matters**.** Based on the available traffic statistics, the **data for March-May 2020** showed **an outstanding increase in** the use of e-commerce services.

This situation, in addition to having a number of negative effects on the economy, **has also provided an opportunity for eGovernment** to **turn** customers who had previously been excluded from eGovernment **into potential users:** the curfew restrictions have led to many new users becoming familiar with eGovernment and, based on their experience, are more likely to choose the electronic route in the future, which may also act as a further catalyst for the development of digitalisation in the public sector. **People have become more open to e-government and** this should be used to further expand e-government.

In addition to client-side and back-office developments, it is important that the **digital state**, learning from the problems caused by the epidemic, **creates** and expands the possibility for **its own employees** to **work and collaborate digitally**, wherever appropriate, regardless of space, location or time of day, and to provide the necessary infrastructure and application conditions in a secure manner.

The proposed measures to increase the range of customer-friendly **digital public services** available and to increase openness and motivation for their use by citizens and businesses are **designed to achieve the** following **main objectives**:

- **customer-centricity:** removing remaining barriers to the use of digital public services, further simplifying the use of various services and e-government, ensuring the further take-up of services **optimised** or developed **for mobile devices**, and providing them in a user-friendly way, in line with customer needs**;**

- **proactive digital public administration: customers** should be able to do everything in one interaction and only need to be involved when it is really necessary, which requires a focus on life-case based services, and true, full proactivity is a prerequisite for the development of predictive service delivery, for which the creation of **data-driven** public administration is essential**;**

- The Hungarian state should be able to provide the necessary background infrastructure for the provision of eGovernment services on a **cloud basis** to the extent necessary, and therefore further development is warranted;

- **data-driven state:** developing registers, increasing interoperability capabilities through automatic data exchange based on the Central Government Service Bus and the development of related services, and introducing conscious **administrative data management** to achieve a higher level of proactivity when critical data is available**;**

- **technology transformation:** applying **AI and robotisation** technologies to the development of eGovernment to deliver truly customer-centric and proactive services, and **using emerging digital technologies** where they bring real added value**;**

- **AI-based solutions, automated decision-making**: the most accurate digital representation of customer intentions, automating processing and decision-making in the medium to long term **by proactively serving** customer needs with minimised or no human intervention;

- **standardisation:** further development of central solutions and platforms, extending their use, replacing existing isolated solutions by applying **industry and international standards**, and, where necessary, by developing national recommendations and standards. Adoption and use of the relevant standards is also essential to comply with EU obligations.

The vision set out in the objectives of this strategy and the above eGovernment development objectives **will be achieved through the following interventions**:

DÁ I. Coordinated user-friendly digital development of central and regional administrations and specialised systems *(set of actions),*

The coordinated user-friendly digital development of central and regional public administrations and specialised systems on all platforms should be pursued through the development of **barrier-free, cloud-based and customer-centric** services, **including mobile devices**, in a **one-stop-shop** system, supporting **cross-border administrations and specialised systems**.

The measure name	DÁ I.1 Implementation of paperless, fully electronic back-office, further development of electronic systems
Purpose and content of the measure	The aim of the measure is to support the transition from paper-based to electronic operations. The improvements will enable the digitalisation of public documents generated by the state. **The main elements of the measure are:** • Robotisation and automation of processes; • The use of artificial intelligence in administration, customer relations and back-office processes; • Introduction of a unified system of records and document management for public undertakings with public service obligations (with a special emphasis on public utilities); • Implement and support the use of an automated administrative decision-making model across sectors; • Developing electronic filing and data capacities

The measure name	DÁ I.2 Further development of central eGovernment services
Purpose and content of the measure	The aim of the measure is to extend the use of central electronic public administration services on an application service provider basis, to connect and integrate specialised systems, and to further develop processes in line with user needs. Based on the experience of making certain public digital building block services available to financial service providers, the further penetration of the G2B2C model in the access to eGovernment services should be promoted for other relevant parts of the market sector. In addition, an important objective of the measure is to strengthen digital citizenship, with the planned outcomes including the ability for all citizens to be able to formally identify themselves and carry out official business via their mobile phone. This requires the development of a digital solution (mobile repository) capable of providing these services. **The main elements of the measure are:**

- Further development of the government's EESEC/ECSEC services, further development of the government's identification, authentication and secure delivery, trust service;

- Development and implementation of new ASP solutions specific to the field;

- Capacity and capability development of the Government Customer Line
using artificial intelligence;

- Capacity and capability development of the electronic payment system;

- Consolidation of existing customer service activities;

- Develop a national IT asset management system to improve the efficiency of public services;

- By exploiting the potential of the digitalisation of public services, to develop an automated process support solution that integrates existing public service systems and supports and accelerates the various administrative processes

- Encourage the use of new identification services provided by the Government (including the widespread use of biometric identification methods) and support their functional development;

- The development of a single and centralised mobile platform where customers can access eGovernment applications from a single interface, which will contribute to simplifying the development of eGovernment applications.

- Comprehensive development of cloud infrastructure

The measure name	DA I.3 Provision and general development of intelligent form technology
Purpose and content of the measure	The aim of the measure is to renew those frequently used administrative services that do not yet have a dedicated, structured intelligent form or a stand-alone ITS application. **The main elements of the measure are:** • Expanding the integration of basic administrative registers for personalisation purposes; • Expanding integration support for SEIOs/EUSRs (e.g. EFER, Government Electronic Signature and Signature Verification Web Service - KEAESZ-WS); • Expand support for system monitoring solutions; • Facilitate faster adoption of the eForm by eGovernment bodies using the eGIS, broadening the range of

	service integration, more functionality, higher availability, better reliability.

The measure name	**DÁ I.4 Improving the overall customer experience in domestic e-administration**
Purpose and content of the measure	The aim of the action is to establish a test centre on the central service provider side, which will both formulate recommendations for improving the customer experience of existing eGovernment services and subject each new public eService to a thorough UX design, usability and customer experience audit during its development and before its launch, with a particular focus on optimising services for mobile devices. **The main elements of the measure are:** • Establish a usability test centre on the central service provider side to improve administration and information on administration (non-government communication!); • As described in the testing schedule, test a set number of services at set time intervals, suggesting what would make the service good for the customer (e.g., design, customer navigation, customer information, web accessibility, elimination of unnecessary bureaucratic or technical barriers, etc.); • Conducting focus group and individual interview surveys with users to better understand and respond to user needs.

The measure name	**DÁ I.5 Enabling domestic e-administration services and related back-office systems for cross-border transactions**
Purpose and content of the measure	The aim of the measure is to implement the necessary improvements to ensure cross-border e-administration resulting from EU policy objectives and obligations, and to carry out improvements for Hungarians living beyond the borders. **The main elements of the measure are:** • Providing European citizens and businesses with the procedures listed in Regulation (EU) No 1724/2018 of the European Parliament and of the Council establishing a single digital gateway to information, procedures, assistance and problem-solving services. • Implementation of the data links necessary for the interoperability of cross-border administrative services through the CCISB, at the system and service level;

	• Implementation of the server-side service required for the provision of documents to Hungarians living abroad; • Ensuring the access to the renewed document systems at the diplomatic missions abroad in order to enable the case management of Hungarians living abroad in the new systems in accordance with the amended legal background • Testing of experimental blockchain technology developments (in EBSI-based European cooperation).

The measure name	**DA I.6 Implementation of automated decision-making and artificial intelligence solutions**
Purpose and content of the measure	The aim of the measure is to improve the procedures of the bodies providing electronic administration through an automated administrative decision-making service implemented with KÖFOP funding. For those types of cases where possible, the aim is to implement automated decision making and AI-based solutions to speed up the decision-making process, improve the transparency and controllability of the process and standardise administrative practices. This can be achieved with the right administrative support and automatic data exchange between registers based on the Central Government Service Bus ("one data in one place"). **The main elements of the measure are:** • Identify decision processes that can be automated and improve them; • Extending the scope of cases with automatic decision making; • Development and application of algorithmic systems based on artificial intelligence (AI), capable of learning and improving themselves based on data.

The measure name	**DÁ I.7 Further improving administrative interoperability**
Purpose and content of the measure	The action aims at further deepening the different dimensions of administrative interoperability (interoperability governance, integrated public service management, legal interoperability, organisational interoperability, semantic interoperability and technical interoperability), taking into account the recommendations of the European Interoperability Framework 2.0 (EIF[81]). **The main elements of the measure are:**

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[81] Source: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif- european-interoperability-framework-0

- To prepare all central services to meet the requirements of the EU's digital public services interoperability, eIDAS Regulation, the European Digital Agenda Regulation and the eGovernment requirements of the Internal Market Services Directive;

- Cleaning up additional databases and migrating them widely to a standard format to facilitate accession to the CCISB;

- Develop a legal framework to ensure the connectivity of sectoral specialised systems and to further develop interoperability between systems

- The migration of previously developed system connections based on direct interface connections to the CSCB, and the interconnection of various internal systems via the CSCB.

The measure name	**DÁ I.8 Improving registries, increasing interoperability capabilities**
Purpose and content of the measure	The aim of the action is to provide IT support for data transfer processes, to develop services and to digitise any registers still kept on paper, taking into account the recommendations of the European Base Registries Access and Interconnection Framework (BRAIF [82]). It is also important to standardize the conceptual and representational aspects of the national data inventory and to establish the Central Government Service Bus (hereinafter: Implementing the service layer of the PSCSB to enable data-driven government decision making, secondary use of data, automation of digital public services, cost-effective operation of public administration and international data provision. **The main elements of the measure are:** - Introduction of data governance; - Master data management and metadata management; - Data architecture, data flow design improvements; - Ensuring data quality and security; - Designing the technology architecture; - Introduction of institutional data management.

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[82] Source: https://joinup.ec.europa.eu/collection/access-base-registries/document/braif-framework-base-registries-access-and-interconnection

The measure name	**DÁ I.9 Developing a new generation of virtual government windows**
Purpose and content of the measure	The measure aims to modernise the personal customer service at government offices by implementing a fully electronic back office, further developing electronic systems, focusing on digital interactions, and extending the electronic processes already available to additional platforms (administration terminal, KIOSZK, robots for use in the personal administration area, mobile interfaces). **The main elements of the measure are:** • **Deployment of artificial intelligence-enabled service points (AI-enabled service points) in government offices (administratorless service):** For those procedures where the administrator's task is limited to the "automatic" aggregation of the data already available and its inclusion in a decision, an automated case management process supported by artificial intelligence will be introduced to reallocate the resources freed up to more complex tasks requiring administrator intervention. • **Development of an online government portal:** In the Online Government Window, as a public service environment, customers can manage their affairs in a way that is easily accessible from anywhere, yet still involves personal interaction. Contact with the administrator is made online via video link. This means that matters that can be handled through government offices can be carried out in virtual space, regardless of time and place, and administrators and customers can be connected in virtual space. • **Continuous development of the Government Office mobile application:** The app currently displays the load (expected waiting time) at government offices and allows you to scan the queue number. By scanning the QR code on the queue number drawn at the government office, the customer receives real-time information about the exact number of customers waiting in front of him/her and the expected waiting time, so even after the queue number has been drawn - in case of a longer waiting time - there is no need to wait at the government office. The aim is to enable customers to book an appointment at a government office of their choice through the app, or even to remotely draw a number to reduce waiting time and the number of customers present in the customer area. It is advisable to establish a link with the Online Government Office and provide the possibility to start a case through the app. The measure also aims to identify, based on an external and internal situation analysis, the procedures that can be fully transferred to the e-government functions of the Government Office mobile application, and to create mobile application interfaces for certain functions for administrators and managers working in the Government Office.

The measure name	DÁ I.10 Reinforcement of the Electronic Administrative Supervision
Purpose and content of the measure	The measure aims at broadening the scope of the Authority's activities and enhancing its powers and proactive support procedural capacity. **The main elements of the measure are:** • Increasing the capacity for IT cooperation (interoperability) between cooperating bodies; • Increase control over the content and quantity of data entered into the government data repository; • Extending the control of electronic administration.

The measure name	DÁ I.11 Further development and functional expansion of the digital consumer protection system
Purpose and content of the measure	The aim of the measure is to provide consumers with an easily accessible, quick and accessible solution for resolving consumer disputes and complaints, and to fully digitalise the related background processes. **The main elements of the measure are:** • Developing electronic solutions to support efficient and effective procedures and administration; • To carry out the necessary surveys, assessments and regulatory tasks; • Internal training and information on new tools.

The measure name	DÁ I.12 Creating a Digital Agricultural Administration
Purpose and content of the measure	The aim of the measure is to renew the specific public environment for businesses and producers in the agricultural sector by digitising services and applying user-friendly solutions. **The main elements of the measure are:** • Digital enhancement of the plant health forecasting service; • Development of remote sensing yield estimation; • Development of an electronic water management and water use system (VIZEK); • Subject-specific cadastre and information system developments; • Developing new public GIS services in the agricultural sector;

	• Further development of the digital traceability system of food chain products (e.g. animals, pesticide use, antibiotics, etc.) in the FELIR system and the creation of a digital basis for authentic consumer information.

The measure name	DÁ I.13 Digitalisation of the justice system
Purpose and content of the measure	The aim of the measure is the further digitalisation of judicial institutions and their processes, the consolidation and development of the systems operating in the field. **The main elements of the measure are:** • Developing digital justice procedures • Creating a digital system for cross-border justice

The measure name	DÁ I.14 Developing the ICT skills of public administration employees, digital support for their work
Purpose and content of the measure	The aim of the measure is to carry out the development of human resources in the public administration in order to effectively implement the improvements listed above. Improvements should be made in parallel with and in line with the development of the relevant administrative service or back office system for all staff concerned. In the case of Government Offices, when a new case is introduced, they may receive prior online or offline training on the new specialised system associated with the case. They are provided with information material and test forms, including frequently asked questions. **The main elements of the measure are:** • To assess the digital competences of public administration employees and identify their development needs; • Implement specific training for staff; • Expanding the possibility of working remotely in the public sector, further development of the government video conferencing platform (VIKI).

DÁ II. Creating a data-based state/public administration
(package of measures),

Widening the use of the ' **one-stop-shopping' principle** (ensuring that citizens and businesses only send the same information to a public administration once), and further developing **interoperable data links** between public registers and relevant back-office systems and eGovernment services, consistent application of the EU interoperability methodological frameworks (EIF, BRAIF), implementation of data-driven government decision making and decision-making, compliance with the forthcoming National Data Strategy and Action Plan are the conditions for the creation of a data-driven state/government. In addition, an important element in the creation of a data-driven public administration is the introduction of conscious administrative data management.

The measure name	DÁ II.1 Modernisation of registers belonging to the national data assets, raising the level of information security, increasing their service capacity
Purpose and content of the measure	The aim of the measure is to modernise the registers, increase the level of information security and improve their service capacity. **The main elements of the measure are:** • Improving the register of personal data and addresses; • issuance of an eRecent card; • Further development of the Electronic Civil Status System; • Further development of intelligent building procedures and registers; • Development of a new land register; • Improving digital registration and data delivery of certificates and certain qualifications documents; • Digitalisation of the paper-based transport registration document library; • Modernisation of employment registers; • Renewing the criminal records system.

The measure name	DÁ II.2 Further development of the Government Data Centre, spatial data and IT infrastructure, capacity building, strengthening geo-redundancy

Purpose and content of the measure	The aim of the measure is to further develop the Government Data Centre, spatial data and IT infrastructure, expand its capacity, strengthen geo-redundancy, develop and standardise the related operational solutions and apply modern data centre solutions. **The main elements of the measure are:** • Operational and cyber security improvements to the Government Data Centre;
	• Capacity expansion; • Strengthening geo-redundancy; • Designing a spatial data services environment; • IT improvements needed to create spatial data asset management.
The measure name	**DÁ II.3 Data-driven renewal of decision-making for digital public services**
Purpose and content of the measure	The aim of the measure is to innovate data-driven decision making related to digital public services and to introduce advanced digital solutions in public administration (e.g. advanced data and information protection, data analysis, processing solutions, artificial intelligence, automated decision making, software robots, etc.). **The main elements of the measure are:** • Ensuring the availability and retrievability of electronically authenticated versions of administrative decisions and resolutions; • Increase data connectivity and data capabilities to enhance the usability of administrative data; • Use public data assets to support complex decisions and analysis; • Introducing data-driven decision-making in vocational education and training and other areas; • Preventive use of law enforcement data, development of a Central Law Enforcement Data Warehouse.

DÁ III. Developing smart communities and regions, supporting the development and operation of local digital public services

The measure name	DÁ III.1 Platform-based central government and local development of integrated smart city solutions
Purpose and content of the measure	The measure aims to increase the connectivity and population retention of settlements, improve the quality of life of their inhabitants by creating advanced smart settlement services, and interoperability between them. **The main elements of the measure are:** • Developing a central smart municipal platform for the efficient delivery of digital content; • Support for local smart municipalities; • Training of local authorities and development of methodologies for them; • Expansion and development of the application portfolio of the Local Government ASP Centre, development of connectivity to registers that are not covered by the ASP but are part of the national data assets, ensuring access to central government specialised systems, launching new central electronic services, establishing connectivity to relevant public specialised systems; • Supporting the creation of links to relevant public sector systems.

DÁ IV.   Enhancing the information security of eGovernment services

The measure name	DÁ IV.1 Development of professional governance institutions and infrastructure for information and cyber security
Purpose and content of the measure	The action aims to develop a professional institutional governance system for information and cyber security. As technology advances, the IT and cyber security landscape is becoming increasingly complex. This calls for increased security awareness, prevention, more in-depth security protection for individuals, organisations and businesses; and a move beyond end-to-end protection products to cyber security platforms.

The main elements of the measure are:

- Increasing preventive and behavioural analysis and action capacities and cyber capabilities;
- Protecting, strengthening and empowering essential services as defined in the Information Security Act, as well as critical infrastructures and their services, and enhancing proactive support procedural capacities;
- Establishing and maintaining data, IT and cyber security from an administrative perspective, with particular attention to the data, IT and cyber security developments that manage and maintain the information system (establishing data, IT and cyber security systems, connecting to central protection systems or using their services);
- Strengthening public confidence, supporting information and actions to be communicated to the public;
- In addition to the extension of government protection, the establishment and development of national and/or sectoral cyber security incident management and incident handling institutional systems, the development of a regulatory oversight system, and the development of a cyber security certification system for ICT devices and services.

DÁ V. Digital development of public services *(group of measures)*

The measure name	DÁ V.1 Development of advanced digital solutions in health, further development of EESZT
Purpose and content of the measure	The objective of the action is to further develop the broad functionality of the Electronic Health Service Space (EESSS) by integrating additional 21st century technologies (e.g. telemedicine, deep learning, etc.), in line with the renewal of the healthcare delivery system, aiming to ensure that all care and institutional processes can be digitally supported, thus making care even more efficient. **The main elements of the measure are:** • Further development of EESZT (online patient management and telemedicine, the digitalisation of the assessment and verification of incapacity for work); • Developing the institutional, legal and regulatory environment for e-health data use and central management of data use; expanding its collection and use; • Establish a validation and quality control organisation for e-health tools and solutions and develop a digital health toolkit; • Implementation and support of population prevention, screening, disease and health management programmes based on artificial intelligence supported by digital tools; • Develop a single digital patient information system; • Health sectoral, sectoral, institutional specialisations IT developments.

The measure name	DÁ V.2 Development of a smart hospital system

Purpose and content of the measure	The aim of the action is to improve access to health services through the development of smart hospital solutions, core elements and services.
	The main elements of the measure are:
	• By strengthening equal and timely access to quality, sustainable and affordable services;
	• Modernising social protection systems, including by promoting access to social protection;
	• Improving the accessibility, efficiency and responsiveness of health systems and long-term care services;
	• Setting up an IT system for hospitals to support management;
	• The introduction of a nationwide coding system, inventory of fixed assets and marking of medical devices, the development of a system for tracking medical devices and the introduction of additional uniform code libraries, which will contribute to the safety of care by increasing the operational efficiency of the care system.
The measure name	**DÁ V.3 Digitalisation of** collections and development of digital services in **libraries, museums, archives and audiovisual archives** for educational, scientific and cultural purposes.
Purpose and content of the measure	The aim of the measure is to digitise the collections of libraries, museums, archives and audiovisual archives, to make them widely and freely accessible for educational, scientific and cultural purposes, and to extend and develop digital services for public collections, in line with the objectives of the Public Collections Digitalisation Strategy (CDS) and the DOS.
	The main elements of the measure are:
	• Extension of the National Library Platform (OKP) system;
	• Further full digitalisation of public collection content (library documents, museum artefacts, archival documents, audiovisual documents), including the selection, preparation for digitalisation, digitalisation, description and making available online free of charge in accordance with copyright and data protection requirements;
	• Expanding and improving digital services for public collections;
	• Within the framework of the National Repository Project (NAP), the creation of a system and service for the dissemination of digital content from public cultural collections.

The measure name	**DÁ V.4 Development of intelligent transport systems** a) Pilot project to improve safe waterborne transport - under the name: Dunainfocontrol; b) Developing intelligent traffic management and traffic simulation systems; c) Development of an information technology system for Unmanned Aircraft Traffic Management (UTM); d) HAD mapping of non-TEN-T expressway and trunk road networks; e) HAD mapping of the TEN-T road network; f) The creation of drone centres, knowledge centres and various organising pilot projects (e.g.: detection of illegal waste;

	blood transport), which will help the domestic UAS (Unmanned Aircraft Systems and systems) ecosystem.
Purpose and content of the measure	The measure aims to develop intelligent transport systems. **The main elements of the measure are:** • Preventive use of data for road safety purposes; • Developing intelligent traffic management and traffic simulation systems; • Developing and implementing IT applications and databases that benefit public transport; • Further rail digitalisation developments (GSM-R[83], ETCS[84]); a) • Improving the safety of inland navigation for passengers and cargo, in line with EU and national targets; • Digitalisation of ship-to-port communication, with on-line dispatching system and "smart AI devices" installed on board ships, relying on AIS to avoid accident situations; • Increasing the safety of navigation on the Danube in the capital city by using 5G technology and AI. Design and implementation of a pilot programme for the section between the two M0 motorways, and design of a pilot programme for the implementation, operation and monitoring of the trial operation; • Processing statistics from the archived data of the on-line system to produce a boat driver training simulator; b) • Support for the development of a data warehouse and architecture to integrate transport facts; • Support for the deployment of a system for adaptive traffic management and for predicting the impact of certain measures on traffic; • The creation of an intelligent, self-learning traffic management and traffic simulation system that is superior to urban traffic management, which uses existing developments to provide an integrated, unified solution for organisations performing traffic management and development tasks to support investment decisions. c)

[83] GSM-R: Global System for Mobile Communications for Railways
[84] ETCS: European Train Control System (ETCS)

	• Establish public monitoring; • Creating the sensor and communication technologies needed to integrate transport systems; • Implementation of traffic management, IT support for avoiding UAV collisions and conflicts; • Laying the foundations for the establishment of a defence drone reconnaissance and interception centre. d) • Non-TEN-T motorways meeting the basic condition for self-driving cars support for 3D surveys of the road and trunk road network. e) • Survey of TEN-T roads at a specified density along the x-y-z axes road axis, pavement edge (lane edge in case of multiple lanes), embankment edge, ditch section; • Create an accurate 3D map of the road from the surveyed data.

The measure name	**DÁ V.5 Development of intelligent energy systems**
Purpose and content of the measure	The measure aims to develop smart energy systems, networks and storage. **The main elements of the measure are:** a) Integrating electric vehicles into the operation of electricity systems; b) Developing common protocols and systems for data processing, data security and data management for renewable and decentralised electricity production, and developing and setting up a centralised management and assurance solution; c) Developing IT systems and solutions that contribute to increasing the flexibility and stability of domestic electricity transmission and distribution, while supporting the efficient system integration of renewable energy producers; d) To create a system that allows energy users to be involved in the regulation of the electricity system; e) IT development for real-time monitoring and optimisation of energy management systems supported by artificial intelligence; f) Facilitate and support the integration of weather-dependent renewable energy producers through the use of ICT tools and IT solutions; g) For managing large volumes of energy data, consumer profiling developing the necessary IT systems to underpin the digital switch-over in the energy sector;

	h) Support systems in public service institutions, preferably supported by artificial intelligence, that can monitor and optimise energy consumption, production and storage in real time; i) The development of IT systems, preferably supported by artificial intelligence, capable of coordinating the consumption/production of decentralised energy consumers and producers, and thus of managing their single market presence; j) Digital customer service and the introduction of efficient, automated customer management based on digital systems (using process automation, AI and robotisation); k) Developing a data-based system to improve the efficiency of biomass-fired power plants involved in district heating supply, with the aim of improving the efficiency of the entire energy production chain; k) Developing a data-driven, artificial intelligence-driven system to increase the efficiency of biomass-fired power plants.
The measure name	**DÁ V.6 Development of intelligent water, waste management, environmental and disaster management systems**
Purpose and content of the measure	The measure aims to develop smart water, waste and environmental management systems. **The main elements of the measure are:** • Water IT developments; • Developing an automated water quality monitoring system that can scan the most vulnerable surface waters at a fairly frequent frequency and automatically alert the relevant bodies in the event of possible contamination; • Further development of the elements of a network and monitoring system for surface and groundwater status; • Improving the efficiency of the collection and treatment of waste collected under public services through digitalisation and the use of aerial remote sensing technology; • data-driven support for the clean-up of illegal waste landfills; • The development of a waste collection system based on IT solutions, in which digital solutions can be used to optimise the emptying mechanism of waste collection vehicles and to track and trace these vehicles; • Further development of specialised environmental systems (remediation, waste collectors, green and blue infrastructure, climate gas database)

	• Establishment of an environmental monitoring system and climate data warehouse, digitalisation of paper-based meteorological and climate data;
	• Using a variety of sensors and remote sensing tools, the development of a system capable of carrying out climate change studies, producing accurate surface and terrain models and urban ecosystem assessment, to support the inventory of the built and natural environment of cities, and to enable the execution of complex model calculations, spatial simulations and the creation of various 3D and building information models (BIM);
	• Designing a beverage package return system using digital solutions;
	• Developing a system to simulate disaster situations;
	• Strengthening disaster management capabilities and disaster resilience by improving the alert and communication systems of volunteer and establishment fire brigades and rescue organisations;
	• Fire safety IT developments.

The measure name	**DÁ V.7 Establishment of a national wind map based on LIDAR[85]ground-based deployment**
Purpose and content of the measure	The aim of the measure is to support the promotion of climate change adaptation, risk management and disaster resilience through the continuous monitoring and analysis of wind conditions in Hungary using cutting-edge technologies. **The main elements of the measure are:** Support for the development of a ground-based wind LIDAR monitoring network and an IT system for receiving, storing and analysing the data generated, a new national wind map and an analysis and forecasting system to support the reduction of certain climate-related disaster risks.

The measure name	**DÁ V.8 Digitalisation of employment policy / labour market specialised systems**
Purpose and content of the measure	The aim of the measure is to consolidate and develop the public IT systems in the employment sector. **The main elements of the measure are:** • The digital renewal of all professional employment systems;
	Modular integration of systems into a new, state-of-the-art framework.

[85] LIDAR: Light Detection and Ranging

The measure name	DÁ V.9 Social, child protection and family welfare services systems
Purpose and content of the measure	The aim of the measure is to consolidate and improve the state IT systems in the social, child protection and family sector. **The main elements of the measure are:** • Digitalisation of all social, child protection and family systems, including the digitalisation of the Day Nursery documentation system; • The modular integration of systems into a new, state-of-the-art framework

The measure name	DÁ V.10 Digital Sport Mentor Programme
Purpose and content of the measure	The aim of the action is to create a National School, University and Recreational Sport Digital Data Asset by linking databases related to physical education and sport in public education, vocational training and higher education, and using analyses of the databases to support physical education, sport choice, talent selection and recreational sport in schools and higher education. **The main elements of the measure are:** • Building a digital knowledge base for physical education and physical activities; • A digital example of physical education in public education and vocational training, published on the National Public Education Portal, which is aligned with the National Curriculum framework, broken down by grade; • Developing a database on fitness for higher education • Digital support for physical education in schools through the development of a user-friendly, easy-to-access, searchable database of physical education practices, closely linked to the National Curriculum, published on the National Public Education Portal.

5.6. Target-device matrix

NDS objective/instrument matrix — Digital infrastructure / Digital competence / Digital economy / Digital state. Columns = Instruments, Rows = Objectives	Developing Gigabit-capable networks	Education, higher education, vocational and adult education, research networks	National Telecommunications Backbone Network, to further develop bandwidth	Further development of wireless communications for preparedness and defence organisations (PPDR)	Expanding the supercomputing (HPC) capacity serving SMEs, research networks and public institutions	Encouraging the development of new generation mobile networks	Launching digital literacy programmes for the general public	Increasing the availability of IT professionals and digitally literate workers	Strengthening digital competence development in public education vocational training and higher education	Dedicated programmes to address areas where digital technologies are lagging behind in terms of integration inside and outside the company	Targeted and innovative development of the ICT sector and ecosystem	Use of public data assets for economic purposes	Central and regional administrations and specialised systems coordinated user-friendly digital development	Creating a data-based state/public administration
Proportion of households covered by a Gigabit-capable network	X					X								
5G coverage to reach 67% by 2025	X			X		X								
At least 75% coverage of district headquarters with National Telecommunications Backbone Network (NTG)	X		X											
Percentage of public education and training institutions with a network connection of at least 1 Gbps bandwidth to reach 100% by the end of 2030	X	X							X					

Indicator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
The size of the national supercomputing (HPC) capacity to reach 15 Pflops by the end of 2030					X															
Proportion of people without digital skills (proportion of people aged 16-74 years not using the internet) to fall below 5% by 2030							X													
Proportion of regular internet users in the age group 16-74 to reach 95% by 2030							X													
Percentage of BSc graduates in higher education in computer science to reach over 10% by 2030									X	X			X							
Percentage of enterprises with integrated (digitalised) business processes (with ERP) to exceed 32% by 2030											X									
Percentage of enterprises using Big Data analytics to reach 15% by 2030											X		X							
Percentage of enterprises selling online to reach 25% by 2030											X									
R&D expenditure in the "Information and communication" as a % of total domestic spending on such purposes to exceed 11%- by 2030												X								
Users of e-Government services (internet users submitting forms) to reach 90% by 2030																X	X			
The DESI indicator "Automatic completion of forms" to reach 90 points (out of 100)																X				
The DESI indicator for full online administration to reach 95 points (out of 100)																X	X			
Digital public services to businesses DESI indicator score to reach 95 points (out of 100)																				X
Proportion of individuals using eHealth services to exceed 70% by 2030																				X
Hungary to become self-sufficient in the provision of government services and the storage of necessary data in the cloud (at least two thirds of these services to be provided from local infrastructure).																X	X	X	X	X

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6. Resource map

In addition to domestic budgetary resources, the NDS and its measures are supported by the following main (large) partly EU funding opportunities between 2021 and 2030:

New Operational Programmes (2021-2027):

Operational Programme (OP)	Digitalisation support area
Digital Renewal Operational Programme Plus (DIMOP Plus)	Digital economy and innovation Digital developments in government and public administration Digital transformation of public services Smart energy systems Environmental protection, disaster management IT developments Digital network infrastructure Digital citizens Digital skills IT professional training Digital education Digital health Digital sport
Economic Development and Innovation Operational Programme Plus (GINOP Plus)	Partial support for the digitalisation of the economy
Urban development Operational Programme Plus (TOP Plus)	Smart settlements
Rural Development Programme (VP)	Digitalisation of the agri-food economy

Direct EU (Brussels) funding:

Programme	Support themes
Digital Europe Programme	HPC Artificial Intelligence (AI) Cybersecurity Advanced digital skills Digital transformation (SMEs, public administration) European Digital Innovation Hubs (EDIHs)
CEF2 Digital Programme	5G, Corridor developments, Gigabit broadband developments, WIFI4EU

Horizon Europe	Digital R&D&I projects
Invest EU	Sustainable infrastructure (including digital network) Research, Innovation and digitalisation
Recovery and resilience tool	Sectoral (e.g. higher education, public education, health) digitalisation and human development Digital elderly care
Other sector specific Sources	E.g. For e-health, cyber and other security, climate protection improvements

7. Institutional system and monitoring

7.1. Key institutions for digitalisation in Hungary

Successful implementation of the Strategy requires an institutional system the members of which are committed to the objectives and instruments identified on the basis of the situation analysis, and are working closely together and supporting each other. The key actors involved in the implementation of the Strategy are described below.

7.1.1. State actors

Cabinet Office of the Prime Minister

The main ambassador of digitalisation within the government is the Minister heading the Cabinet Office of the Prime Minister. According to the Statute Decree, within the Government, the Minister heading the Cabinet Office of the Prime Minister is responsible for e-government, IT, the unification of e-government and IT developments and ensuring the feasibility of public administration IT infrastructure. [86] The centralisation of management, which used to be spread across several ministries, is designed to make the delivery of tasks more efficient, eliminate duplication and achieve the objectives of the strategy more quickly.

Digital Hungary Agency Zrt. (DMÜ)

Pursuant to DMÜ Decree[87], the Minister heading the Cabinet Office of the Prime Minister shall perform certain tasks related to e-government, IT, the unification of e-government and IT developments, electronic communications for government purposes and ensuring the infrastructural feasibility of public administration IT through the Digital Hungary Agency.

THE DMÜ:
- shall oversee the implementation of the Unified Strategy for eGovernment and IT Development and Services, the Infocommunications Infrastructure Development Strategy and the National Digitalisation Strategy;
- shall ensure the effective development of a unified, transparent and structured national IT and eGovernment system, and shall ensure the organised provision of public administration IT infrastructure;
- shall define the tasks and the way of carrying out the development of information technology and e-government.
- shall coordinate the professional activities of the state-owned companies involved in this task,
striving for efficiency and synergies;
- shall liaise with relevant governmental and non-governmental actors and organise their cooperation;

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[86] Statute Decree (182/2022. (V. 24 Government Decree) 9. Sections 6-9. (https://njt.hu/jogszabaly/2022-182-20-22)

[87] DMÜ Regulation (307/2022. (VIII. 11.) Decree of the Government on the designation of the Digital Hungary Agency as a private limited company and on the definition of certain tasks and detailed rules related to the coordinated provision of services) Section 2

- shall represent the sector in international relations related to eGovernment, performs tasks related to the preparation of the transposition of EU legislation in the field of information technology, infocommunications and digitalisation, as well as other international legislative and related tasks, shall participate in the work of the EU Council and the Commission on EU legislation and strategic planning in the sector covered by its tasks, and in the coordination of this work at home;

- shall monitor and examine the digital competence level of the population and businesses, the level of development of the digital infrastructure in Hungary, international cooperation opportunities to better exploit the benefits of digitalisation, and the opportunities for the introduction and development of data-driven sector management in all areas of the Hungarian economy.

Prime Minister's Office

Pursuant to the Government Decree 182/2022. (V. 24.), the Minister in charge of the Prime Minister's Office shall be responsible for supporting the development of government strategies, administrative quality policy and personnel policy, public administration development and public administration organisation. As regards the development of territorial public administration, for policy planning, support, harmonisation, coordination and monitoring of its implementation.

Ministry of Economic Development

The ministry shall be responsible (among others) **for the digital and technology-based renewal of** individual **industries and sectors,** for the policy planning, support, coordination, coordination and monitoring of the implementation of programmes **supporting the transition to Industry 4.0**, and for the **ICT sector,** in cooperation with other ministries (above all the Cabinet Office of the Prime Minister and the DMÜ).

National Media and Infocommunications Authority (NMHH)

The **National Media and Infocommunications Authority (NMHH)** shall be responsible for the **regulation and supervision of communications** in Hungary, as well as **media supervision,** with the same objective in all areas: to promote development and competition in the market, and to effectively represent the interests of consumers and users in Hungary - and to do so in international negotiations. The NMHH also runs digital literacy and media awareness activities for the general public (e.g. the Media Literacy Training Centre in Bűvösvölgy).

National Telecommunications and Information Technology Council (NHIT)

As part of its strategic scientific activities, the **NHIT** shall provide **opinions on** proposals for government IT procurements and application developments; shall analyse, evaluate and provide opinions on government IT developments and procurements, shall **make proposals** for the short, medium and long-term direction of government IT developments, and provide **opinions on proposals and** individual decisions of **the Government related to communications and IT**.

Regulated Activities Supervisory Authority (RPA)

As a Hungarian element of the cyber security certification system developed by the European Union, the Regulated Activities Supervisory Authority (hereinafter: SZTFH) was designated as the national cyber security certification authority as from 1 January 2022 as a result of the amendment of Act XXXII of 2021 on the Regulated Activities Supervisory Authority and Act L of 2013 on the electronic information security of state and local government bodies. As part of the domestic cyber defence, the Authority shall perform the tasks of the authority certifying the cyber security of digital products, and in the field of strengthening cyber security, another main priority of the NCA is to raise cyber security awareness, i.e. to raise awareness of the threats in cyberspace and to help citizens navigate safely in the online space.

Other background institutions, bodies:

In addition to the above-mentioned organisations, **there are a number of background institutions and coordination organisations** under the control of the various ministries that play a role in the development of digitalisation, which it is not the task of this document to list, enumerate or detail.

7.1.2. Civil actors

Key civil/professional actors in the field of digitalisation:

- **Hungarian Association of Digital Companies (IVSZ)**

  The IVSZ is the largest representative organisation in the ICT sector in Hungary. According to its statutes, the Association aims to promote the development of the information and communication technology field, to promote the professional and industry interests of its member organisations, to increase the national and international recognition of infocommunication and digitalisation, and to promote, support and conduct ICT research, development and innovation.

- **Communications Reconciliation Council (HÉT)**

  The Communications Reconciliation Council (HÉT) is the largest interest representation organisation of electronic communications service providers in Hungary. Its members include all the major telecommunications operators operating in Hungary, as well as the representative organisations of smaller operators. Its aim is to create a supportive environment that allows the use of the latest technologies and the highest quality services to the satisfaction of users. Since 2002, the HÉT has been working continuously, in strategic partnership with the government, to improve the operating conditions of the Hungarian communications market. Its mission and one of its most important tasks is to facilitate industry consultation, build professional consensus and catalyse digitalisation in Hungary, and to spread the benefits of digitalisation more widely.

- **Information Technology for Society Association (Infotér)**

The statutory purpose of the Association is to represent the interests of society, on the grounds that IT developments in the public sector are in the interests of society.

To this end, the Association:

- carries out research and information tasks related to the country's information and knowledge-based development;

- for the purpose of representing the interests of society, provides opinions on IT developments in the public sector, informs the public and formulates methodological recommendations in this regard;

- expresses and communicates its views on legislation affecting IT;

- helps to integrate Hungarians living beyond the borders into the information society.

Other professional organisations with a main focus on infocommunications:

- Association for Telecommunications and Information Science (HTE)

- Hungarian Communications Association (MKSZ)

- Hungarian Cable Television and Telecommunications Association (MHKSZ)

- Zoltán Magyary e-Government Association

- Neumann János Computer Science Society (NJSZT)

Of course, **there are many other professional and advocacy organisations in Hungary** with a **general** social, economic or administrative focus **that also give priority to digitalisation**, the most important and largest of which is **the Hungarian Chamber of Commerce and Industry,** which has a dedicated IT college and coordinates the Modern Enterprises Programme.

7.1.3. Monitoring

The primary task of the monitoring system is to examine the implementation/fulfilment of the objectives set out in the situation analysis chapters of the Strategy, thus enabling public intervention in areas where the achievement of the objectives set is not progressing according to the schedule set out in the Strategy or where there are developments that run in the opposite direction compared to the original objectives.

With regard to the methodology of the monitoring system, it is particularly important to

1. provide an opportunity to demonstrate the quantified achievement of the Strategy's objectives,

2. ensure international comparability wherever possible (e.g. EU, OECD),

3. the statistical data used are produced according to a common methodology, and therefore the monitoring system relies on EU (and/or OECD) statistics wherever possible[88].

The monitoring report covers all the pillars set out in the Situation Analysis chapter of this Strategy, and is structured in a coherent way to provide an opportunity to present the changes.

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[88] In the case of other typically country-specific and/or internationally not measured areas, the monitoring report relies on surveys made by the Central Statistical Office and other primary research findings.

7.1.3.1 The tools of the monitoring system

Detailed indicator system

Based on the situation analysis, developing a detailed set of indicators with baselines and targets for each element of the digital ecosystem.

Information portal

To facilitate the monitoring tasks and to ensure the publicity and transparency of the monitoring system, a portal should be created containing, inter alia, the following monitoring information:

- indicator system and calculation methodology, and current and time series values of indicators
- document library
    - an updated version of the strategy
    - progress of the strategy, annual reports
    - current version of other digitalisation-focused strategies
    - documentation of aid schemes
    - impact assessment of aid schemes
    - the results of any (related) primary research

Regular reporting to the Government

In order to provide the Government with a continuous overview of the developments related to digitalisation and in the ICT sector, the Strategy should be accompanied by an annual monitoring report on progress and submitted to the Government in October each year.

Preparing interim evaluations

Changes in technology and use trends can be monitored and reflected in the Strategy through rolling/ongoing planning. Regular review of the Strategy is a necessary precondition for this. Interim evaluations help in better informing the strategic planning. This requires an interim evaluation every 3 years on the implementation of the Strategy and the functioning of the implementation system.

8. Annexes

8.1. Annex

Government strategy documents reviewed in the preparation of the NDS

Pillar	Strategy	Government Decision	Link to the NDS
All pillar	National Development and Spatial Development Concept	1/2014. (I.3.) OGY decision	The NDS is consistent with and fits in with the objectives of the document OFTK.
Digital Infrastructure	Gigabit Hungary Strategy (Its findings were incorporated into the National Digitalisation Strategy.)		Integrated into the NDS target device system
	Report to the Government on Hungary's 5G Strategy (Its findings were incorporated into the National Digitalisation Strategy.)		Integrated into the NDS target device system
	Digital Infrastructure for Higher Education, Research Institutions and Public Collections Development Strategy (DHIFS, its findings will be incorporated into the National Digitalisation Strategy.)		Integrated into the NDS target device system
Digital Competence	Hungary's Digital Education Strategy	1536/2016. (X. 13.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Hungary's Digital Strategy for Child Protection	1488/2016. (IX. 2.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	A change of gear in higher education - medium-term policy strategy 2016	1359/2017. (VI. 12.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Digital Workforce Programme (DJP, working material)		Integrated into the NDS target device system
	Vocational Training 4.0 - Vocational training and medium-term policy strategy for the renewal of adult learning	1168/2019. (III. 28.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Education Strategy 2021-2030 for the European Union	1551/2020. (VIII. 25.)	The NDS is consistent with and aligned with the objectives of the document.

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Digital Economy	National Strategy for the years 2021-2027 Smart Specialisation Strategy (S3)	1428/2021. (VII. 2.)	The NDS is consistent with and aligned with the objectives of the document S3.
	Strategy for strengthening Hungarian micro, small and medium-sized enterprises 2019-2030	1627/2019. (XI. 8.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Digital Business Development Strategy (SME Digital Development Strategy (MICE, ITM - working paper)		Integrated into the NDS target device system
	Digital development concept for micro-enterprises (DJP, working document)		Integrated into the NDS target device system
	Central Hungary Regional (KMR) Digital development concept for SMEs (DJP, working document)		Integrated into the NDS target device system
	Strategic concept for the digital transformation of industry (Industry 4.0) (NGM, working paper)		Integrated into the NDS target device system
	Digital Sport Strategy (DJP), in preparation)		Integrated into the NDS target device system
	National Energy Strategy 2030 and First Climate Change Action Plan (CCAP)	23/2018. (X. 31.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Digital Services Trade Development Strategy (DJP)	1334/2017. (VI. 9.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Hungary's Fintech Strategy (DJP) - strategic study (The Ministry of Finance did not support its submission to the Government.)		Integrated into the NDS target device system
	Digital Health Industry Development Strategy (DJP, incorporated in the Health Strategy of the ITM)		Integrated into the NDS target device system
	Hungary's Digital Startup Strategy (DJP)	1858/2016. (XII. 27.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Hungary's Digital Agricultural Strategy (DJP)	1470/2019. (VIII. 1.)	The NDS actions take into account the strategic tools to avoid parallelisms.

	Hungary's Digital Export Development Strategy (DJP)	1491/2016. (IX. 15.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Hungary's Artificial Intelligence Strategy	1573/2020. (IX. 9.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Hungary's Research, Development and Innovation Strategy (2021-2030)	1456/2021 (VII.13)	The NDS actions take into account the strategic tools to avoid parallelisms.
	White Paper on National Data Policy strategic planning document		The objectives known from the planning document are subject to the NDS.
	Digital Food Industry Strategy	1479/2022 (X.11)	The NDS actions take into account the strategic tools to avoid
Digital State	National Security Strategy of Hungary	1163/2020 (IV.21)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Network and Information Systems Security Strategy	1838/2018. (XII. 28.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Report to the Government, The Digital Success Programme 2.0 Work Plan 2017-2018, point 11(a) of the Work Plan 2019 (digitalisation of public administrations)		
	DJP Digital Strategy for Public Collections	1175/2018. (III. 28.)	The NDS actions take into account the strategic tools to avoid parallelisms.
	Public Administration Development Strategy 2021-2027		NDS actions take into account strategic tools to avoid parallelisms

	National Health Informatics Strategy	1455/2021. (VII. 13.)	The NDS actions take into account the strategic tools to avoid parallelisms.