



# Hungary's Artificial Intelligence Strategy

2020-2030

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## Minister's Greeting



Beyond doubt, in 2020 the technology of artificial intelligence (AI) has become part of our everyday lives. The integration of AI-based technologies in the economy and society is accelerating. The unavoidable changes accompanying the spread of the technology offer major opportunities for sustaining and increasing the level of Hungarian economic growth, improving the competitiveness of the Hungarian corporate sector, developing business and public administration processes aimed at users, and for achieving environmental and climate protection targets supported with state-of-the-art technologies.

The Hungarian Artificial Intelligence Coalition was established in October 2018 to offer a community and forum for all stakeholders in the Hungarian AI ecosystem who wish to make an active contribution to the development of the Hungarian AI environment and skills. This Strategy is the joint, action-oriented product of the Coalition's professional community, consisting of over 240 organizations and 1,000 delegated experts. The creation of the Strategy initiated an exemplary bottom-up cooperation and market creation among the stakeholders, as part of which an action plan was developed as early as in the autumn of 2019 to perform tasks not requiring government decisions. The implementation of the Strategy is also based on this cooperation.

This document represents a living strategy that reflects the agreement and will of state, academic, market and social stakeholders to take action. The Strategy requires continuous oversight and fine-tuning in consideration of the joint lessons learned in the course of implementation and the forecast revolutionary innovations of AI technology. By way of this document, the Government affirms its commitment to developing Hungarian artificial intelligence – as a special branch of its digitalization efforts – to be high-tech and green, in line with our general development objectives. In other words, we aim to make the most of the opportunities offered by modern technologies for improving the quality of life of citizens and protecting the environment.

I sincerely believe that this Strategy and the successful implementation of the social, technological, economic and personal changes it envisages will play a crucial role in Hungary's future.

**Prof. Dr. László Palkovics**  
Minister for Innovation and Technology

# Executive Summary

Artificial intelligence (AI) – as the sum of algorithmic systems capable of teaching and improving themselves based on input data – carries long-awaited potential for change in relation to economic and social processes. The mapping of certain segments of human skills by learning machines also offers a practically unprecedented improvement to the efficiency of the economy and administration, and to our private lives. The changes are inevitable and can be experienced directly by anyone in the 21st century.

The extent to which states and communities within these can effectively exploit these benefits depends on forward-looking and comprehensive planning, ambitious goals and their methodical implementation. **Both the economy and society must be prepared for the approaching changes.**

## Economy

Effective implementation of artificial intelligence through processes based on the skills of a knowledge-based society significantly contributes to economic growth. According to forecasts, by 2030 **an AI adoption rate of 11.5%** in the Southern European region, including Hungary, **could generate a GDP added value of HUF 6,400 billion** to the national economy.

## Competitiveness

The combination of human labour skills with artificial intelligence can benefit the Hungarian corporate sector in several ways. In the case of repetitive, highly standardised work processes, it can lead to a faster and more accurate performance. In relation to tasks typically requiring human skills, it can support jobs that are data-driven and allow greater human creativity.

The AI Strategy aims to make a significant contribution to objectives also defined in the Strategy for Strengthening Hungarian Micro, Small and Medium-sized Enterprises by **enhancing the productivity, further added value and export capacity of Hungarian enterprises.**

## Societal challenges

According to the results of the Hungarian labour market survey conducted within the framework of the AI Coalition, the spread of AI-based technologies may affect up to 900,000 jobs in Hungary by the 2030s. This equals roughly one quarter of all current jobs. According to certain expert estimates, more than 40% of jobs can already be automated at the moment, thus the transition may lead to the replacement of human labour (as a result, some jobs may vanish or change in nature and new jobs may emerge requiring new competences).

Systems applying AI ideally only complement and strengthen the skills of human workers, leading to the desired improvement in efficiency. **Harmonious cooperation between man and AI, however, is conditional on the appropriate preparation of Hungarian workers and Hungarian citizens in general**, the forecasting of labour market trends, and support for adoption and transition.

## International environment

International trends in AI regulation reveal growing activity. Most countries with developed economies have already adopted AI-related strategy papers or are in the process of adopting such a document. Between 2018 and 2019, the European Union drew up the document entitled *Coordinated Plan on Artificial Intelligence*, which recommends that each Member State adopt a separate AI strategy or supplement other relevant strategies with a dedicated AI section as early as 2019. Between 2018 and 2019, the OECD, the European

Council and UNESCO expressed the need to draft a separate AI regulatory instrument. The European Commission issued the *White Paper On Artificial Intelligence: a European approach to excellence and trust* in February 2020, which assesses the possible regulatory framework of artificial intelligence in Europe.

## Existing Hungarian capabilities

There are already a number of initiatives applying AI in Hungary or laying the foundations for its future use (e.g. chatbot customer service, precision agriculture applications, predictive maintenance systems, fleet route optimization, inventory forecasting, medical diagnostics) and a number

of frameworks are available that significantly contribute to supporting the future introduction of AI (autonomous vehicle testing environment, integrated health data sets, central identification service). By building on these initiatives, we have good prospects of achieving substantial progress in the application and further development of artificial intelligence.

Retraining and upskilling will be a key in the Hungarian labour market until the 2030s in the 21st century renewal of our skills system. Regarding the current activity of the National Employment Service (hereinafter “NES”), there must be a shift towards competence based recruitment both in the assessment of supply and demand, for example through the adoption of ESCO classification and AI technologies of employment services.

## The Artificial Intelligence Strategy

**Recognising the potential benefits of the technology and simultaneously taking into account the possible related challenges, the Government of Hungary has resolved to have a comprehensive Artificial Intelligence Strategy (hereinafter “Strategy”) drawn up. The document sets goals up to 2030 and outlines a related action plan extending up to 2025. It is important to emphasise, however, that the Strategy needs to be regarded as a living document and reviewed at least every two years due to rapid technological development and growing experience related to the spread of applications.**

The Strategy proposes the following main groups of measures.



### Foundation pillars

The so-called foundation pillars of the Strategy prepare society to manage inevitable changes resulting from AI effectively and to fully exploit the advantages of the technology.

The foundation pillars aim to establish the internal and external conditions of AI development in Hungary. The **AI value chain** covers the internal conditions. Elements of the AI value chain are:

- support for the data economy ensuring access to public and private data;
- building a community of basic and demand-driven researchers and developers;
- building an ecosystem supporting the individual and corporate use of technology.

The **AI frameworks** provide the “external” conditions necessary for the above processes. These are:

- human skills necessary for the confident use of AI;
- availability of software and hardware resources;
- a clear regulatory environment that supports further development and innovation.



## Focus areas

The measures defined within the framework of the sectoral and technological focus areas aim to strengthen the growth potential of the Hungarian economy and to improve its efficiency in a targeted and conscious manner

- through the use of available AI technologies, on the one hand;
- and the development of future technologies, on the other.

Within the framework of a sector and technology-driven approach, the Strategy assigns priority to sectors that can be most effectively improved by AI-based applications: manufacturing, agriculture, healthcare, public administration, logistics, transport and energy.

In relation to the above, based on current Hungarian capabilities, the Strategy defines the R&D areas that can contribute the most to the technological support of the above-mentioned sectors and where Hungary can also gain advantage at an international level.



## Transformative programmes

The long-term plans – defined as transformative programmes and setting very ambitious objectives – make it possible that the additional benefits of the implementation produce extra value for citizens even before these programmes are “closed”. This category of measures does not include programmes in a traditional sense, but rather complex means-end schemes provided in a form that is readily comprehensible for society as a whole. The directions outlined here show the ambitious path Hungary is to take for the stakeholders of both the Hungarian and international AI ecosystems.

The transformative programmes provide a long-term point of orientation in relation to matters of national strategic relevance such as

- energy and agricultural challenges induced by climate change;
- the spread of autonomous systems and the labour market;
- the relationship between citizens and the data-based economy; or
- the need for developing the modern digital service provider state.

Considering the very diverse possibilities for applying AI, this Strategy approaches the sum of its goals as a horizontal initiative that spans different fields. Accordingly, the detailed elaboration of the objectives defined for certain areas by the Strategy, the working out of related measures and the determination of necessary instruments remain the option and responsibility of competent stakeholders within the respective sectors. Therefore, the primary task of the organisations to be set up within the framework of this Strategy is to provide the AI support to the independent initiatives of these sector stakeholders, in line with the goals they define.

# 1

## Why is an AI strategy necessary?

**Artificial intelligence is a piece of software capable of mapping parts of human intelligence, and supporting or autonomously performing processes of sensing, interpreting, decision-making and action. The technology offers special capabilities and is closely followed at both the economic and social level.**

The progress achieved by AI, as technology<sup>1</sup>, in the past 10 years is often observed as the start of a new industrial revolution. In this case, however, progress is not dependent on natural resources; instead, the competence of the available human resources determines its limits. This technology affects everybody; it radically transforms expectations of the labour market, opens up new dimensions for improving efficiency and offers the potential for substantial economic growth. Development, however, is achieved in a global, competitive environment and raises a number of sovereignty issues. Hungary is thus offered a historical opportunity and challenge.

### 1.1 Personal, deep, disrupting

Artificial intelligence is an abstract technology but everyone is affected. We are personally affected because many fears, expectations and concerns are already associated with AI; it is impossible to ignore the topic. Although the technology is already applied in our day-to-day lives, in our work and enhancing our entertainment, in its most tangible form AI enables certain segments of man’s most important ability, intelligence, to be learnt by machines. Therefore, the development of AI raises fundamental but also practical philosophical questions and encourages coordinated action at a completely new level, the reconsideration of business process flows and jobs, and the introduction of norms and regulation at a social level.

Artificial intelligence will be integrated in all layers of our life, economy and society, with a potential for profound and fundamental changes. It is possible to obtain basic information on AI anywhere and to use devices with integrated AI. The business process flows and jobs developed with AI modules, however, will fundamentally call coordination processes, regulatory frameworks and forms of social cooperation into question.

AI is a global technology, without borders or a need for physical resources. Due to global competition for and continuous interest in talented people, a large part of

basic development is open source. For this reason, an innovation introduced in technology or a business model is able to spread around the world in a matter of weeks or months questioning and disrupting processes and habits we believe to be natural. AI will certainly play an important role in tackling one of the biggest challenges of our day: global climate change. The opportunities offered by AI may be effective in reducing greenhouse gas emissions and in implementing measures helping our adaptation to the effects of climate change.

These processes will create a world that demands continuous adaptation, awareness of innovation and learning during our entire lives. The progress achieved by AI, as technology, in the past 10 years is often observed as the start of a new industrial revolution. In this case, however, progress is not dependent on natural resources; instead, the competence of the available human resources determines its limits. This technology affects everybody; it radically transforms expectations of the labour market, opens up new dimensions for improving efficiency and offers the potential for substantial economic growth. Development, however, is achieved in a global, competitive environment and raises a number of sovereignty issues. Hungary is thus offered a historical opportunity and challenge.

<sup>1</sup> In this document, artificial intelligence is understood to mean “narrow” AI, i.e. systems only capable of mapping specific areas of human intelligence. Research into “general” AI – capable of mapping the entire human intelligence – remains underdeveloped and uncertain, and is therefore not applicable within this context

## 1.2 Transformation of the labour market

In close combination with the topic of automation, in the near future AI will substantially transform the labour market and expectations related to the competencies necessary for work.<sup>2</sup> **By the end of the 2030s, automation and AI are expected to affect 900,000 workers in Hungary.**<sup>3</sup> According to certain expert estimates, more than 40% of jobs can already be automated in Hungary<sup>4</sup>, thus the implementation of the transition may result in the replacement of labour. The spread of AI, however, not only results in the elimination of jobs but also changes the competencies necessary for existing jobs, creating opportunities for filling new jobs.

In the coming decades three successive waves of AI and automation are expected:



Algorithm wave    Augmentation wave    Autonomy wave

The so-called **algorithm wave – lasting until the mid-2020s** – will affect sectors based on data processing, such as the financial sector, IT related sectors and administrative jobs. The workers typically affected are young people and women. This wave is expected to affect 5-10% of jobs on average.

The **augmentation wave – between 2025 and 2030** – will affect service sectors relying on office work, such as the financial sector, education, public administration and IT based services. This wave is expected to affect 15-20% of jobs in the given sectors. As a difference compared to the first wave, the proportion of affected women and men is expected to be identical, with a higher proportion of more experienced, middle-aged workers.

The third wave is expected to arrive in the **2030s**. The so-called **autonomy wave**, is expected to impact manufacturing, on the one hand, and highly complex jobs involving responsibility on the other. This wave is expected to produce the biggest impact, affecting 25-30% of jobs, mainly men and more experienced workers. The most significant changes are expected in manufacturing, where 384,500 jobs could be exposed to these changes, and the spread of AI technology will affect 107,900 jobs in goods transportation and additionally 106,600 jobs in the construction sector. Automation and AI will mostly affect skilled workers and labourers; these jobs are expected to be completely transformed during the third, autonomy wave. This means that the nature of the work of every third skilled worker and labourer will change. The changes will also impact the group of machine operators, and more than 149,000 such employees will face challenges until the end of the next decade.

A change of such magnitude requires coordinated preparation at a societal level, with everybody's involvement. In the planning, preparation and implementation of development projects, the relevant organisational units of the NES need to play an important role in the appropriate forecasting of and support for labour market trends resulting from the technological transition.



## 1.3 Opportunity to boost economic growth and competitiveness

AI is able to raise the productivity of employees and processes to a new level, offering major potential for economic growth. Since the improvement of labour productivity may reach 40% by 2030 in certain countries, major investments are under way to increase export capacities and added value available in this form.

Additionally, Hungary is a popular target in the Central Eastern European region for the outsourcing of workflows with high added value. The failure to adopt AI may pose a risk to that status if economies currently providing lower added value are more successful in adopting AI-based applications and will therefore be able to produce higher added value with lower operating costs.

A good indicator of the global economic activity is that the annual amount of venture capital investments related to AI has increased six-fold during the past 20 years (since 2000).<sup>6</sup> Revenues from the global AI software market are expected to increase from 10.1 billion USD in 2018 to 126 billion USD by 2025.<sup>7</sup> The application of AI is expected to increase mainly in consumer internet-based services, the automotive industry, financial and telecommunications sectors and trade.

Global GDP is expected to be 14-16% higher by 2030 – amounting to 13,000–15,000 billion USD – owing to the steadily accelerating spread of AI-based technologies.<sup>8,9,10</sup> The estimated effects, however, vary significantly between geographical regions. AI is expected to increase the GDP by 26.1% in China, by 14.5% in North America, by 9.9% in Northern Europe and by 11.5% in Southern Europe.<sup>11</sup> At the time of preparing the above study, based on the ratio

of Hungarian GDP to global GDP in 2017, **an additional GDP increase of HUF 6,400 billion is estimated in 2030 in Hungary, in consideration of the average expected increase in the Southern European region.** In the table below, we present Hungary's expected increase in GDP by following the AI application models indicated for other regions involved in research.

Analysed region	Expected GDP increase induced by AI application (as a proportion of GDP in 2030)	Expected Hungarian GDP increase (HUF bn) by reaching the given region's adoption rate (2030)
Latin America	5.4%	3,005
Northern Europe	9.9%	5,508
Southern Europe	11.5%	6,399
North America	14.5%	8,068
China	26.1%	14,523
Global average	14%	7,623

These figures clearly show how investment in increasing the Hungarian adoption rate **can contribute to a GDP increase in an order of magnitude of one thousand billion forints by 2030.** Based on the technology's economic and social relevance and the dynamics of its spread, it is essential for Hungary to exploit the opportunities offered by AI proactively as well.



2 PwC UK - Will robots really steal our jobs? (Arntz, M. T. Gregory and U. Zierahn (2016), 'The risk of automation for jobs in OECD countries: a comparative analysis', OECD Social, Employment and Migration Working Papers)

3 PwC Magyarország Kft. (2019): How will AI impact the Hungarian labour market. <https://www.pwc.com/hu/en/publications/assets/How-will-AI-impact-the-Hungarian-labour-market.pdf>

4 Grace Lordan: Robots at work – A report on automatable and non-automatable employment shares in Europe, London School of Economics and Political Science, 2018

5 <https://www.accenture.com/hu-en/insight-artificial-intelligence-future-growth>

6 <https://techjury.net/stats-about/ai/>

7 <https://www.tractica.com/newsroom/press-releases/artificial-intelligence-software-market-to-reach-126-0-billion-in-annual-worldwide-revenue-by-2025/>

8 <https://www.forbes.com/sites/andrewcave/2019/06/24/can-the-ai-economy-really-be-worth-150-trillion-by-2025/#49ec4ad13bf4>

9 <https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy>

10 [https://www.itu.int/dms\\_pub/itu-s/opb/gen/S-GEN-ISSUEPAPER-2018-1-PDF-E.pdf](https://www.itu.int/dms_pub/itu-s/opb/gen/S-GEN-ISSUEPAPER-2018-1-PDF-E.pdf)

11 <https://www.pwc.com/gx/en/news-room/docs/report-pwc-ai-analysis-sizing-the-prize.pdf>

## 1.4 Solid European cooperation and global competition

A growing number of countries are recognising the depth of changes attributable to accelerating competition and technology, and are defining their own concepts concerning the development of AI. The **European Union** drew up a coordinated plan on artificial intelligence in 2018 and 2019, which outlines how the EU plans to contribute to the AI development of Member States in relation to individual components of the AI value chain.<sup>12</sup> **In the 2021-2027 budgetary period of the Union, an adopted national AI Strategy of a Member State can substantially support successful tendering for centrally distributed, AI-related support.** The coordinated plan recommends that each Member State adopt a separate AI strategy or supplement other relevant strategies with a dedicated AI section as early as 2019.

In May 2019, Member states of the **OECD** adopted the recommendations of the Council on artificial intelligence<sup>13</sup> that define principles relating to reliable and human-centric AI, and encourage member states to support AI development and the wide-ranging use of the technology with long-term investments. In early 2020, the organisation also launched a separate network consisting of AI experts (ONE AI), which held its first meeting at the end of February 2020.

In June 2019, Ministers of the **G20** group adopted “*human-centred AI principles*” based on the work performed by the OECD.<sup>14</sup>

By focusing on the question of human rights, in September 2019 the **European Council** convened the first meeting of the AI Ad Hoc Committee (CAHAI)<sup>15</sup>, which is mainly responsible for examining options for the broad framework regulation of AI development, planning and application, together with multiple stakeholders.

Within the framework of the UN, at the 40<sup>th</sup> Session of the **UNESCO** General Conference – dealing with educational and cultural matters – held on 21 November 2019, the Social Science Committee accepted without any changes the recommendations of the study on the ethics of artificial intelligence, relating to the drafting of an international normative instrument. Accordingly, in January 2020, the organisation set up a task force to draft a global, AI focused legal instrument.

Without exception, developed states have recognised the significance of AI and have accordingly started the development of the necessary regulatory environment, in which a separate AI strategy is often a central element.

On 25 April 2018, Hungary signed the Declaration of cooperation on Artificial Intelligence, together with 24 other European states, which sets out the intention of the signatories to cooperate in the field of European AI development and AI-supported innovation.<sup>16</sup> The Coordinated Plan on Artificial Intelligence of the European Union was prepared in December 2018<sup>17</sup>; it made strong recommendations for all Member States to adopt separate AI Strategies in 2019 or supplement their other relevant strategies with an AI footing.

Recognising the potential of AI and mindful of its impact on economic development, AI is a key area of the European Commission’s digital policy. The 2021-2027 multi-year budget assigns a priority to supporting AI: it is one of the key areas of funding in the draft regulation on the establishment of the Digital Europe Programme in the 2021-2027 period.

In the 2021-2027 budgetary period of the EU, programmes with centrally distributed funds are expected to have greater emphasis, therefore it is a major advantage if, in the course of awarding funds, tenderers from the given Member State are able to demonstrate their state’s commitment to the given field. In relation to artificial intelligence: this means that the availability of a comprehensive AI Strategy is in practice a prerequisite for funding successful tenders.



## 1.5 An issue of national sovereignty

New methods of attack and influence appear in a digital world, which create new forms of vulnerability and endanger the self-determination and autonomy of the individual, the community and the state. With the spread of artificial intelligence and the potential abuse of AI, these threats are increasing in strength and appearing in new forms.

AI creates new targets and methods of attack in the field of cyber defence, where the race to obtain data is expressed through intensifying economic and political attacks. At the same time, artificial intelligence enables more sophisticated, complex operations based on influencing, which directly target citizens and raise new issues in both regulation and oversight.

When integrating technologies with everyday processes, it is necessary to examine the critical processes and regulatory framework that can ensure the integrity of the

interests of citizens and communities. As the quality of data is a key factor in teaching artificial intelligence, special attention needs to be paid to the protection of socially and economically critical data, and the guarantee of the right to self-determination and freedom in line with European values.

Actors in public administration need to make coordinated efforts to address the above threats and risks, and to prepare society for the conscious and responsible use of the technology.

**It is clear that, in order to achieve the dynamic pace of development of artificial intelligence as a technology, its potential for economic growth and effective involvement in international processes, it is essential for Hungary to clearly express its position on the subject and set its priorities regarding technology-related details.**



<sup>12</sup> [https://ec.europa.eu/knowledge4policy/publication/coordinated-plan-artificial-intelligence-com2018-795-final\\_en](https://ec.europa.eu/knowledge4policy/publication/coordinated-plan-artificial-intelligence-com2018-795-final_en)

<sup>13</sup> <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>

<sup>14</sup> <https://www.mofa.go.jp/files/000486596.pdf>

<sup>15</sup> <https://www.coe.int/en/web/artificial-intelligence/cahai>

<sup>16</sup> <https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence>

<sup>17</sup> <https://eur-lex.europa.eu/legal-content/HU/TXT/HTML/?uri=CELEX:52018DC0795&from=EN>

## 2

## Where do we stand now and what can we build on?

To define the target system of the AI Strategy, it is necessary to identify those capabilities with the greatest potential for supporting the research, development, application and use of AI in Hungary. This chapter of the Strategy not only presents the areas in which AI-based technologies are already used and which can thus be used to develop additional capabilities but also provides an overview analysis of Hungary's strengths, weaknesses and opportunities, and the risks of application in this area.

### 2.1 Already proven fields of use

AI technology can be broadly used; its application in Hungary is already underway. The integration of available technologies and drawing on the related experience at an organisational and sectoral level is ongoing. The non-exhaustive list below includes AI projects already implemented or in progress in Hungary:



#### Telecommunications

- automated customer service with phonebots and chatbots
- forecasting failures in the network infrastructure
- tailored sales offers for customers
- AI-supported tailoring of marketing messages
- automated CV screening and video interview analysis
- calibration of network coverage by deploying self-learning antennas



#### Banking and insurance

- automatic answering of incoming e-mails using language processing
- support of credit analysts with analysis of financial risks
- AI-supported photo-ID authentication process
- modelling the occurrence of possible damage events
- preliminary processing of incoming claims
- identification of fraud and abuse by analysing transaction patterns



#### Retail

- forecasting inventory levels
- forecasting the formation and reduction of checkout queues,
- personalised advertisements advertising in stores based on age and sex identification
- dynamic pricing system



#### Transport / logistics

- automated warehousing system with autonomous vehicles
- continuous route optimisation to increase fleet utilisation
- reporting of railway obstacles + trash along the railway track
- development of data processing in self-driving vehicles
- automatic rail transport



#### Manufacturing

- forecasting manufacturing unit faults using sensor data
- defect detection using visual recognition
- production capacity optimisation
- reduction of inventories using demand forecasting
- image-based, high-precision automatic robot positioning



#### Agriculture

- autonomous control of agricultural machinery
- precision landspreading of pesticides and plant nutrients
- identification of crop problems by analysing drone images
- identification of sick animals using camera movement analysis
- weight estimation with camera imagery
- automatic dosage of nutrients based on individual needs of animals



#### Energy

- forecasting energy consumption
- supporting network maintenance using drone image analysis
- forecasting retail network consumption and personal recommendations
- processing invoice images using software robots



#### Healthcare

- analysis of mammography images, recognition of diseases
- identification of possible medication needs based on open data
- recommendation of new active substance structures using learning systems
- analysis of national healthcare patterns



#### Public administration

- AI-supported identification with help of the Central Client Authentication Agent
- drawing up of minutes using dictation
- self-service Government Window administration
- online self-service administration with the support of an expertise system
- crime prevention with the support of big data based behavioural analysis
- testing autonomous vehicles in a military environment
- cybersecurity protection using AI algorithms

At the present time the above examples are isolated; often only a few organizations apply these methods within a sector. Nevertheless, they clearly show that Hungary already has solid foundations for introducing the technology. Hence, the Strategy must primarily focus on the spread and application of continuously expanding opportunities.

### 2.2 What we can build on

**In addition to the introduction of the technologies already in use, it is important to examine the capabilities available in Hungary that will support the future ecosystem; data assets, regulation, infrastructure and government.**

The vibrant, diverse and active domestic AI **ecosystem** is an advantage, especially in the field of autonomous vehicle development. Active cooperation has evolved in several sectors (manufacturing, agriculture, healthcare, transport, logistics, autonomous systems) between university research networks and centres of excellence, and market players.

In the field of **data collection** there has been a number of supportive developments in the public sector that allow the use of AI. There is a unique wealth and integration of data in both education and healthcare, but the exploitation of AI applications based on these is still at an early stage. The agricultural machinery fleet is commonly fitted with young and modern technologies that enable the integrated management and use of data derived from the precision economy.

Regulation of the testing of autonomous vehicles on public roads is a specialty, which, subject to an authorisation process, enables testing in road traffic without a territorial or time limit. This also contributes to the organisation of the ongoing developments in the ecosystem and to the connection of autonomous transport and vehicle control with the international development market.

In terms of **infrastructure**, we can rely on broadband internet coverage in Hungary, which is good by European comparison. As a result of the international connections of the Hungarian research network (e.g. CERN), Hungary already offers available computing capacities that are currently complemented with high performance computing (HPC) capabilities. The autonomous vehicle and smart city test track in Zalaegerszeg represents a key infrastructure element, capable of integrating the digital and physical world in order to create flexible testing opportunities.<sup>18</sup>



The broad portfolio of the regulated electronic administrative services (REAS-s) is similarly an advantage that facilitates the transition to digital administration for **public administration** actors, standardises legally adopted technologies and creates economies of scale. The Central Client Authentication Agent (KAÜ), as a service providing electronic authentication for citizens, is the starting point for all web-based management of public administration and the opening up of the service to market players is a further opportunity of use.

### 2.3 Things to watch out for

The AI Strategy contains a proposal for mitigating the effects of identified weaknesses. In these cases, special attention must be paid to opening up the operation of data assets, strengthening the start-up ecosystem, strengthening the culture of experimentation (especially in the field of digital competencies) and reducing global vulnerability in Hungarian language processing, data management and the use of platform technologies.

As a weakness, we have to face the fact that, in Hungary, development projects related to AI are **isolated**, uncoordinated and there are no actors with comprehensive knowledge of them. Additional integration is therefore needed in this area. **Data assets in public administration are still only accessible with limitations**, isolated and only partially capable of cooperation; data sets with a multiplying effect are still unable to boost the economy.



In the field of AI development, the comparative international wage advantage of the labour force available in high-level research and other knowledge-intensive fields, the ease of entering the AI technology market, **macroeconomic stability**, proximity to European R&D networks and the ability to channel domestic AI innovative solutions into EU regulation and development, as well as actively shaping them, is clearly an opportunity for Hungary.

Organization of the **start-up ecosystem** has only been undergoing strong development in recent years; Hungarian AI start-ups do not play a major role in the global market. The practice and implementation framework of marketing knowledge capital created at higher education institutions is still lacking; as such we have yet to witness the launch of dynamic and economically viable start-ups.

There is also room for development in the **entrepreneurial culture**; both individuals and enterprises lack confidence in innovation and experimentation<sup>19</sup>, which are also critical for the adoption of new technologies. In terms of **digital competencies**, paper-based operations can still be observed in many places alongside some digitally advanced enterprises. The digital competence of Hungarian society fares poorly by European comparison.<sup>20</sup> Additional efforts are needed in these areas for the introduction of AI.

Hungary's **vulnerability** to global service providers is a risk; it does not have its own platform technology with which it could already operate confidently in the areas of competition determining the future. It should be taken into consideration that relatively few people speak Hungarian and therefore the global market is not interested in the market-based production of **high-quality Hungarian language processing**. This may weaken use of the Hungarian language in the digital age. There is also a danger of lagging behind in global competition, especially in the development of more intensive or effective AI in the field of both civil and defence technologies of offshore and nearshore countries compared to domestic ones.

## 3 What are the objectives?

The Strategy assessed and presented the above Hungarian and international situation relating to artificial intelligence, with a separate discussion of existing strengths and opportunities for development. Based on the identified situational picture, in this chapter the Strategy defines the objectives to be fulfilled by adoption of the Strategy, including their defining principles and the target indicators set for the period covered by the Strategy.

### 3.1 Targets

Let's use and develop artificial intelligence together, in a responsible manner, as global partners, to serve our daily routine.

**Artificial intelligence is already a technology of the present.**

It builds into our everyday devices, it transforms our business procedures and has a huge impact on society, even though the intense development of the technology has just begun. The spread of the prepared technologies is still in its infancy; the technologies that are under development hold out or threaten further breakthroughs, and its effect has only just started to unfold at an ever-accelerating pace.

Learning together

**Artificial intelligence transforms people's lives.**

**Hungary aims at putting the opportunities of the applications of artificial intelligence into the Hungarian people's service uniformly, and along with concentrated efforts, and at the same time, it wants to defend people against the technological and social risks.** We have to prepare together for an era full of new challenges and opportunities, and we have to find balance together in such areas that are brought up and created by the continuously developing technology.

In order to participate in this transformation together and in a competent manner, everybody shall find his or her role, and we must bring the technology closer through education, trainings and the promotion of experimentation with AI. Besides, we start AI programmes bringing changes in people's life and having effects at a social level, which are inspiring, spectacular, effective, and have a leading spirit even at a European level.

Developing and using it effectively

**AI will be decisive for economic competitiveness.**

**The Government of Hungary intends to support Hungarian enterprises and those enterprises that are operating here and create future workplaces in a focused and dynamic manner, by building on the existing competitive advantages and by gaining a position in the currently developing industries.** For this reason, we have started a widespread programme for the development of the data economy, and the introduction of the application and construction of the technology, and in its framework researchers, developers and adopters can find, in close cooperation, how they can best react to the continuously changing domestic and international market environment by using the new opportunities provided by AI. Hungary sees great potential in the use of AI technologies in the less digitalised sectors and layers, so it considers AI as a potential breakout point in the course of accelerating digitalisation efforts.

<sup>19</sup> <https://ec.europa.eu/docsroom/documents/35894>

<sup>20</sup> <https://ec.europa.eu/digital-single-market/en/scoreboard/hungary>

In a responsible manner, in a formalised structure

AI fundamentally effects the whole of society and determines its management and service.

The Government of Hungary is introducing the use of the technology into the services provided by the state and establishing the frameworks of responsible development and use deliberately, consistently, and in a formalised structure. For this reason, it is establishing and motivating the responsible management of data assets and carrying out the modernisation of its procedures, as well as preparing for management by data and AI, especially regarding the development and safe maintenance of healthcare. Besides, it creates regulation frameworks that which ensure the affected people's or the final users' rights in the course of both the use of the data and the development of the technology, whilst they create transparency and security for the enforcement bodies.

As global partners

AI is a global technology that rewrites methods of cooperation and international relations.

Hungary cooperates and takes a role in the joint efforts as an active participant and positions itself in the duality

of global competition and cooperation, and by building its digital sovereignty. To this end, it takes a role in the joint digital market development efforts of the European Union; it actively works on the establishment and introduction of a regulatory environment created in harmony with European, including Hungarian, values and interests, and it has bilateral relations with other countries in the course of economic and social collaboration. Moreover, it participates actively in the state and civil (not only consumer) interest representation organisation appearing in the global arena of economic force.

Assisting our daily lives

AI is a pragmatic technology with real effects.

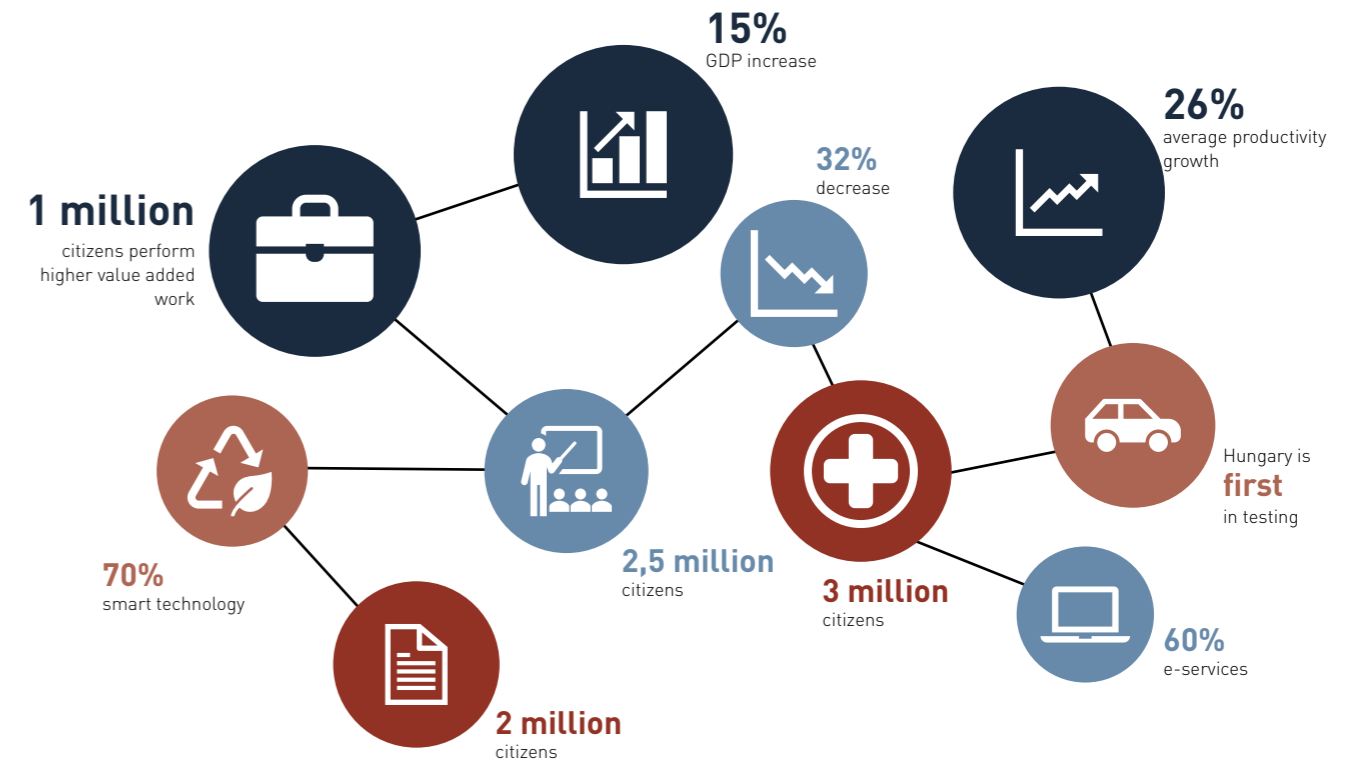
Hungary intends to introduce the application rapidly, deliberately, and by putting the theoretical concepts into practical purposes. To this end, it is defining and launching transformative programmes that have highlighted and ambitious aims, which define focused actions in the fields of self-driving vehicles, healthcare, agriculture, safe use of data, the use of renewable energy sources, customer service and education. All the programmes have major social effects, and they are initiatives affecting people's everyday life, in which the impact of artificial intelligence serving people and enhancing the quality of their life can be experienced.

### 3.2 Defined target indicators

The starting point of the AI Strategy is the mindful and broad-based preparation for the changes caused by AI. The intended level of preparedness will improve the openness of the Hungarian labour market to innovation; the labour force, having the appropriate skills, will increase the added value produced by the Hungarian corporate sector, and the developing Hungarian corporate sector can thus increasingly contribute to the development of the whole national economy. In line with the structure of the interdependent system of national economic development, the Hungarian corporate sector will be able to produce more added value, as well as having a well-trained and agile labour force; the AI Strategy determines the following, high-level targets for 2030:

<p><b>I.</b> 15% GDP increase induced by AI; and AI adoption exceeding the regional average</p> <p>In comparison with GDP forecasts for 2030, the economic development caused by the increasing uptake of AI is 11.5% in our region, and 14% at a global level. However, Hungary set the target at 15%, thus aiming to exceed both the regional and the global level.</p>	<p><b>II.</b> 26% average productivity growth in the Hungarian corporate sector compared to 2020 (the increase of gross added value per person employed)</p> <p>According to forecasts, the productivity growth enabled by AI is between 11 and 37% at a global level.<sup>21</sup> Hungary intends to achieve 26% productivity growth with respect to Hungarian-owned domestic enterprises by 2030, thus supporting the objectives of the Hungarian SME Strategy in this field.</p>	<p><b>III.</b> 1 million citizens perform new or higher value-added AI-supported work due to a change in position or workplace</p> <p>An estimated 900,000 employees will be affected by AI and automation by the middle of the 2030s. The government of Hungary aims for even more employees to be able to perform work that has high added value and provides a better quality of life by 2030.</p>
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Let's use and develop artificial intelligence together, in a responsible manner, as a global partners to serve our daily routine.



21 <https://www.accenture.com/us-en/insight-artificial-intelligence-future-growth>

## Objectives by 2030 directly affecting citizens



Hungary is the main European centre for the development and testing of self-driving vehicles



2 million citizens take an active part in the management and use of their own data with the help of a data wallet



70% of the scheduling of renewable energy production is carried out by smart technologies



Due to the use of data-based systems, the emission of ammonia in agriculture decreases by 32%



2.5 million citizens benefit from AI-supported education



60% of administration is carried out electronically, in the form of self-service



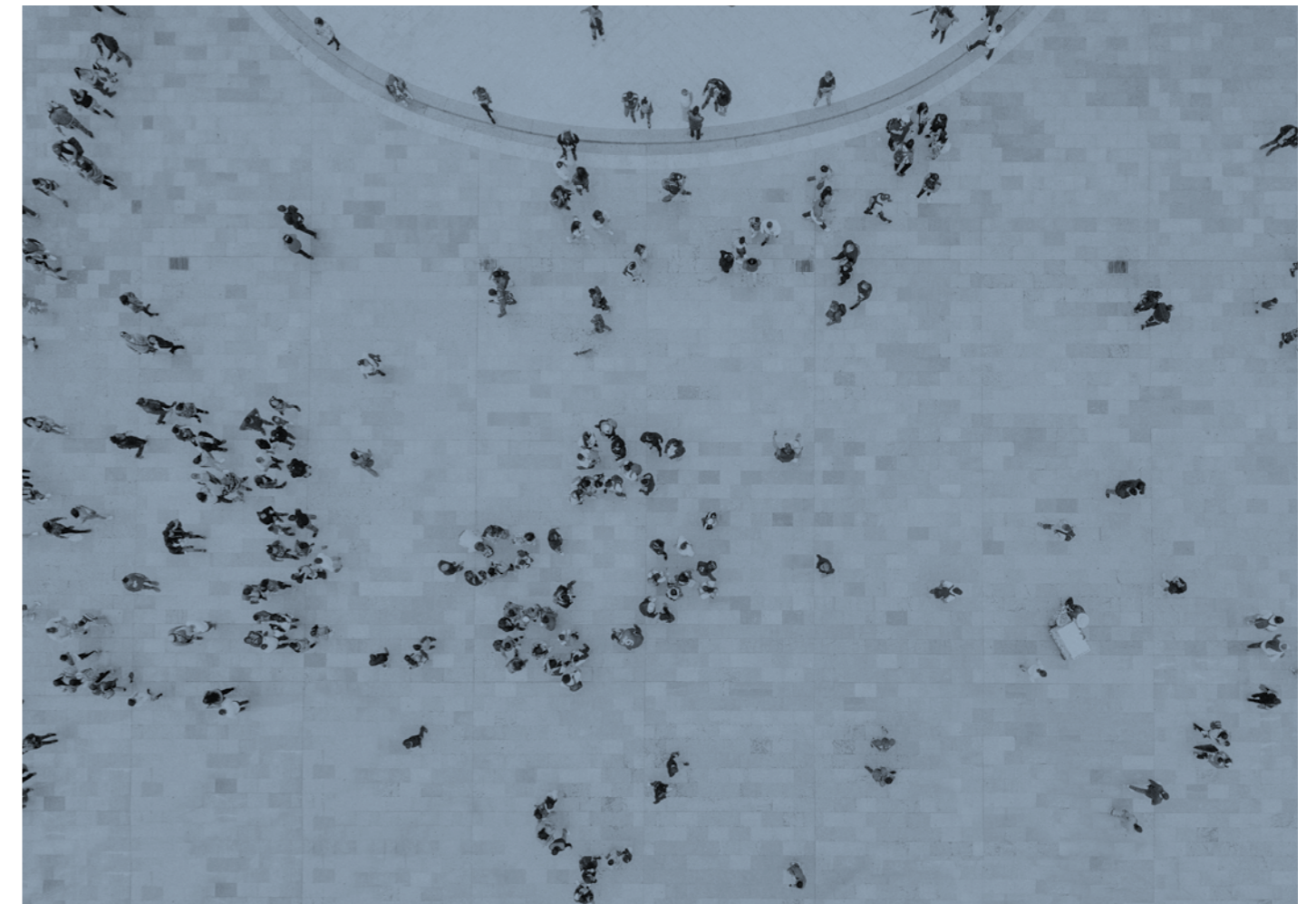
AI integrates into the healthcare system, and 3 million citizens can benefit from AI-based modern services through the digital healthcare system

## 3.3 The relationship between the AI Strategy and other government strategies

The spread of applications based on artificial intelligence may be expected with regard to every branch, so artificial intelligence may impact all sectors in the future. Hence, government measures related to artificial intelligence may only be implemented effectively in the context of collaboration between sectors.

The mid- and long-term objectives of each branch are defined by independent government strategies for the sectors. The measures and objectives of this strategy have

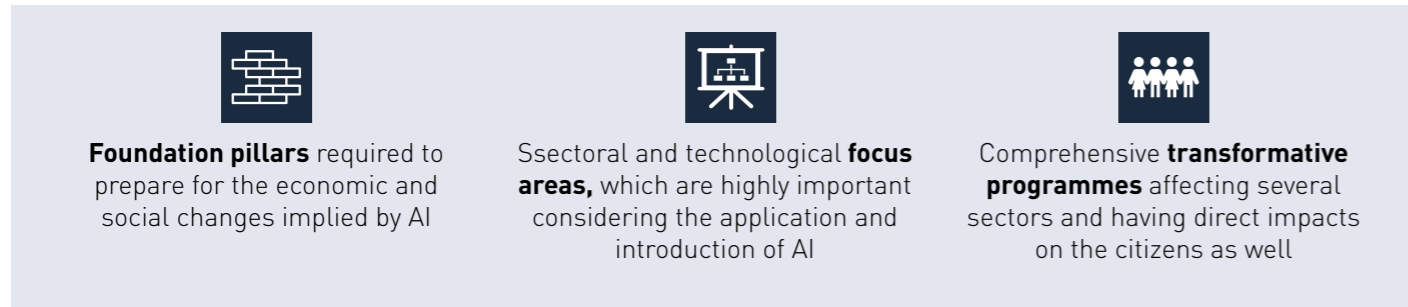
been established by considering the sectoral strategies adopted (and those planned while this strategy was being drawn up) by the Government. In light of this, the main aim of the present strategy is to harmonise and at the same time increase the effectiveness of artificial intelligence-related governmental measures affecting the sectors, thus contributing to the achievement of the objectives specified in separate sectoral strategies. The present strategy thus primarily supports the effective implementation of the sectoral strategies according to their designated targets.



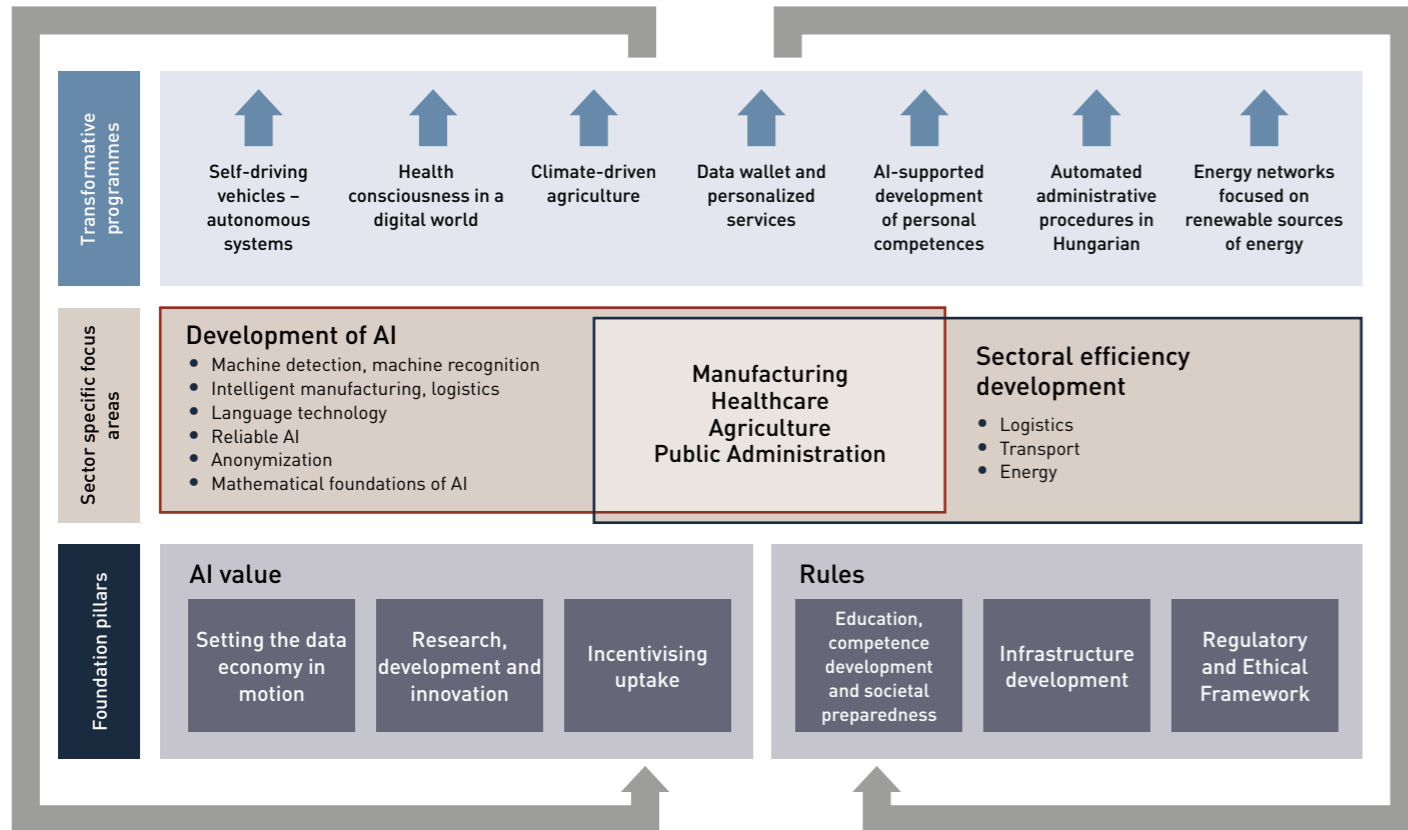
# 4

## What are we doing?

Based on the assessment of the domestic technological features, the Strategy makes proposals for numerous partly interdependent measures and intervention areas. The Strategy classifies these as follows:



The following figure outlines certain groups of measures of the Strategy and their relationship with each other.



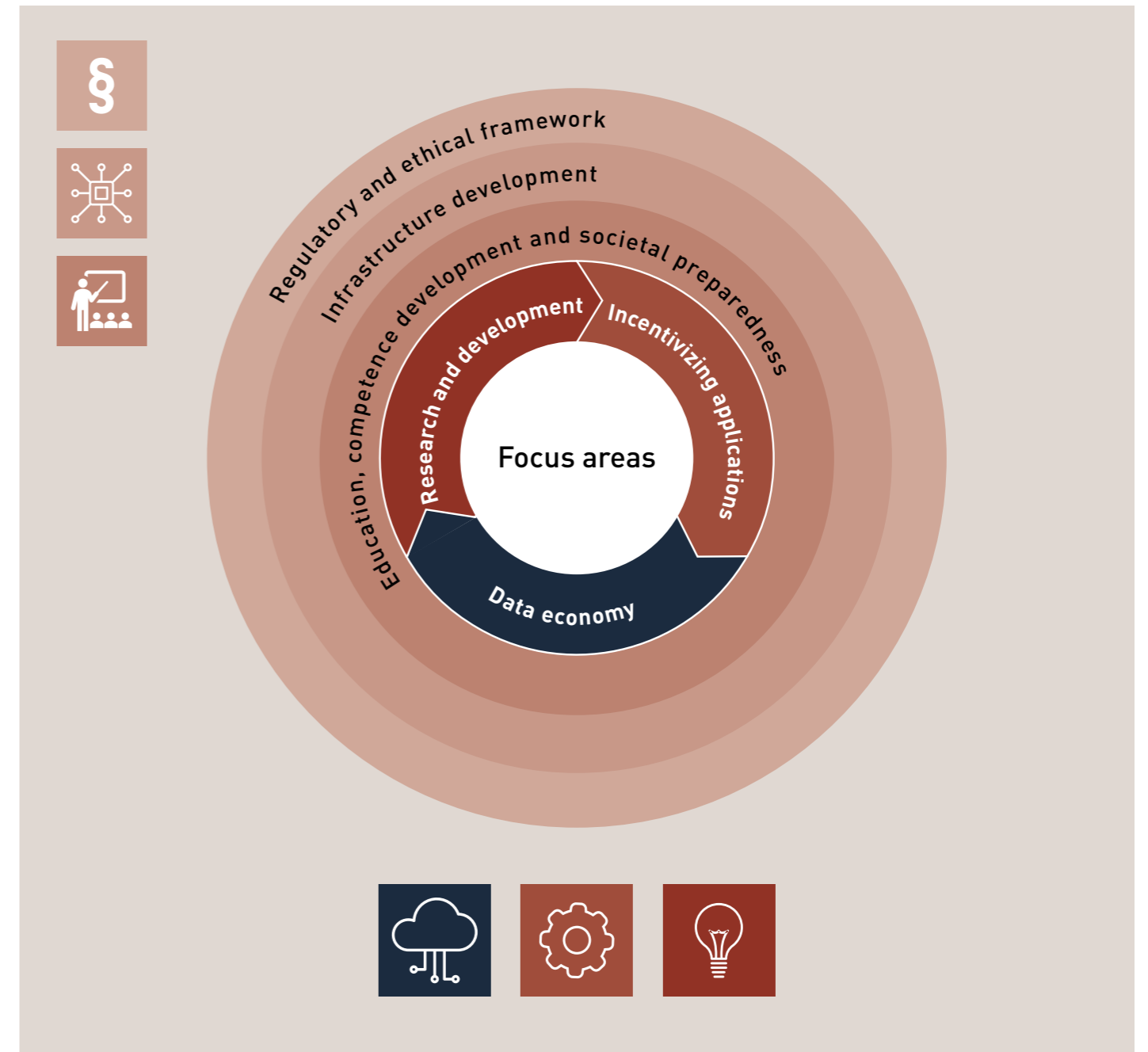
The foundation pillars, which are grouped as the elements of the AI value chain and the frameworks of use of the technology, are shown in the bottom line of the above figure. The AI development objectives of the highlighted sectors and technologies can be based on these foundation pillars and are thus shown in the middle layer of the figure. The transformative programmes directly affecting society are

in the upper segment of the figure, with arrows pointing up due to their expected effect. In the course of implementing the transformative programmes, we pay special attention to the resulting direct labour market processes and the management of transitions in cooperation with the organisational units of the NES (National Employment Service).

### 4.1 Foundation pillars

The so-called foundation pillars of the Strategy prepare society manage inevitable changes resulting from AI to effectively and to fully exploit the advantages of the technology.

Three of the foundation pillars are elements of the AI value chain, while three provide the framework for the operation of the value chain. The following figure shows the relation between the foundation pillars of the Strategy.



The measures related to the foundation pillars:



#### 4.1.1 Mathematical foundations of AI

Making the collection of data and its secondary use and the management of data assets in both the private and the public sector conscious and regulated.

The basic elements of solutions using artificial intelligence are data processing and data analysis. That is why one of the main objectives of the Strategy is to provide the data, including private and state data, supporting the operation of such applications. It is significant that the measures defined here mainly serve to facilitate and encourage data processing while fully respecting the custodians' rights laid down by the law, and the limits specified by the domestic and international legislation for the use and processing of the data, with special attention to the protection of personal data, including healthcare-related and other sensitive data.

**The aim** is to make available the data underlying AI developments and the system of platforms and organisations providing the opportunity for secure and regulated sharing and secondary use of these data.

**Draft KPI:** minimum 1,000 agreements concluded for the secondary use of data made available

#### The establishment of the opportunity for the use of private data based on market conditions (Data market)

The aim is to establish and raise awareness of the economic value of commercially viable data, and to encourage their secondary use to take advantage of their potential as a resource of the future

The instrument of this action is the introduction of a Data market platform (Adatpiac Platform) in three stages:

- In the first stage, a **marketplace exercising brokerage function** shall be established, which provides a space for the transmission of non-personal data and the related technologies. After that, the aim is to further develop a marketplace that is capable of more than the brokerage functions and can provide data storage as well as data quality based on standards and certificates.
- In the second stage, we intend **to create the commercial opportunities for the data assets including personal data**, and to prepare the introduction of individuals as actors into the data market (linked to the development of a related mobile app).
- The third stage includes the creation of the *"One Stop Shop"* platform, which operates **as a platform serving data custodians, as well as the researchers and developers of the application**, with broad-based functionality, by integrating the data assets of the data markets and data spaces of the EU and by the active use of data spaces of the EU in the course of using Hungarian data.

#### Making the public data available in line with EU legislation (Portal for public data »Közadatportál«)

The aim is to establish a complete and responsible national data management scheme, which includes sharing non-personal data assets created in the public sector and having a significant multiplier effect in order to exploit the potential economic stimulation effect associated with their wide availability. An additional goal is the creation of an integrated public approach, which can help exploit the benefits of such economic growth in light of the investment needed to guarantee such open access to data. Based on this principle, different types of data shall be identified and either made freely available or funnelled into the Data market (see next section).

The aim is standardised data generation and data format determination, which enable easy access to the data for research and development purposes to be possible and monitoring the use of public data at an organisational level.

- In order to connect public data into the data cycle, a new body, the National Data Asset Agency (Nemzeti Adatvagyon Ügynökség, hereinafter "NAVÜ") shall be established, to coordinate and stimulate the strategic management of the data assets as the engine of utilising national data assets. It should be emphasised that NAVÜ will not perform independent data processing – this remains the task of the custodian organisation –, its aim is only to encourage and support data utilisation.

- For the sake of transparency, the establishment of a public data portal is required, which gives access to the data and provides a one-stop connection opportunity to access the national data assets freely – based on EU legislation – and, on the other hand, it makes the relationship between the state and businesses (G2B), the state and clients (G2C) and the states (G2G) possible.

We aim at fully integrating the secondary use of the data created in the public administration into the data cycle and at establishing an effective model for the management of public data.

- We must identify those groups of data, the commercial use of which has already started or which may be involved in commerce, and NAVÜ and the Data Market can promote the effectiveness of their commerce.

#### Trading public data based on market conditions (relationship between the Data market and the Portal for public data)

It is a key objective to ensure market-based trading in data having a significant multiplier effect and created in the public sector but not subject to Directive (EU) 2019/1024 on open data and the re-use of public sector information (PSI Directive) by connecting the Data market and the Public Data Portal.





#### 4.1.2 Research, development and innovation – “Joint forces for development”

Building research synergies, placing the developers of the technology in an advantageous situation, celebrating technology-based innovators in order to cooperate in the technological research and development as an ecosystem based on domestic and European synergies.

The establishment of targeted, broad-based and dynamic AI research excellence embedded in an ecosystem.

**Draft KPI:** 15 instances of cooperation in international projects in the topic of technological research and development, of which at least two target a topic related to defence technologies, and five international AI patents

#### Key directions for AI research and development

##### Development of machine detection

The development and customisation of machine detection in relevant fields is the cornerstone of major applied research, and embraces features such as merging sensor data from various imaging systems (camera, LIDAR, radar, etc.) and other sensors, depicting an unknown environment, pre-processing measured values, and improving their accuracy, as well as detecting and compensating for erroneous measurements and distorted data. There are two critical areas to be observed: on the one hand, we wish to have a significant impact on the preservation of human health through medical imaging, and on the other, when applied in the manufacturing and agricultural sectors, we endeavour to achieve significant cost reductions.

##### Development of intelligent manufacturing, logistics and IoT solutions based on machine learning

Due to the expansion of connected devices and the Internet of Things (IoT), an exponentially increasing amount of data is available with specific noise types and device-specific data formats. The methods of machine learning make it possible to learn the rules, functions, and decisions automatically and without human intervention or assistance. More accurate, reliable decisions require resource-intensive analysis of large amounts of data, and the design and implementation of complex optimisation and numeric procedures. The task is to examine the stability of a system containing a machine learning procedure, i.e. to probe whether

the consideration of a new training point degrades the properties of the system. Their goals include the control of complex systems with a machine predictive control (MPC) algorithm, control signal, and providing guarantees for the stability of the controlled system.

##### Development of language technology

The interpretation of spoken and written texts is one of the fastest growing areas in the world. The application and further development of existing technologies to the Hungarian language is of significant national interest. One of the most important instruments for this is the development of Hungarian training corpuses both for written and spoken language, through which the understanding of Hungarian language, processed by open source software solutions, can be upgraded to the level of major languages. To this end, the aim is to support a community of researchers that can contribute to the survival of our language in a digital era by joining the corporate and academic efforts.

##### Developing a reliable AI

One of the barriers to the broad use of AI originates from the limitations of the current state of technology. In line with efforts made by the EU, we will focus on eliminating possible forms of error in AI, or making it transparent and predictable (developing test environments), making model decision-making mechanisms explicit, or developing hybrid models (interpretable decisions) and developing debugging

algorithms specialised in AI software that can help detect errors typically made by AI. Such development and integration of reliability into everyday technologies enables the technology to be used in critical decision-making situations, as well as in situations where reliable human-machine collaboration is required.

##### Development of data anonymization technologies

One of the most important resources of AI developments is the data. Only anonymous personal data shall be included in the teaching models, and shall be an object of trade and transferred to third parties. However, anonymous data can be decrypted using technological and inferential equipment, depending on the context of use. In order to ensure the secured data trade that takes user rights into full consideration and thus to ensure AI development, it is critical to define new technological and process developments that can guarantee the unambiguity of personal data.

##### Development of the mathematical foundations of AI

Machine learning and deep learning, the branches of artificial intelligence currently gaining the greatest attention, are based on high-level mathematics, in which, combined with data and computational capacity, we saw a major breakthrough in the early 2010s. However, at the same time, we have incomplete knowledge of the mathematical foundations and limitations of the method. Certain mathematical theories researched by domestic researchers with world-class excellence and based on linear dimensionality reduction, the regularity lemma and graph limit theory promise a breakthrough. The question is, how these theories can be used for, inter alia, artificial neurons, the key manifestations regarding AI research. Another important topic is the theory of deep learning and machine learning optimisation methods based on topological multiplicity.

#### Encouragement of basic and applied research in key technological areas, such as machine vision, language interpretation and data anonymization, as well as in fields related to branches of industry, or defence technologies, and the presentation of key international research results in targeted technological and sectoral areas

The resources and opportunities of Hungary are limited, compared to the continuously expanding opportunities of research and development, so only the harmonised expenditure and use of the existing R&D resources may result in significant domestic AI development.

The aim is to present research results of international importance in key technological (see box above) and industrial fields (healthcare, manufacturing, agriculture, public administration) and also related to defence technologies, by creating a research ecosystem organised through industry-led networking that can focus on research areas in order to respond to industrial needs.

To this end, a National Artificial Intelligence Laboratory (Mesterséges Intelligencia Nemzeti Laboratórium) shall be established, which will act as a coordinating body between each of the basic and applied research institutes, the market, the AI research scene and the international research community.

- International research centres could be solicited to move to Hungary as an auxiliary measure and the coordinated worldwide communication of the established Hungarian research initiatives and results, as well as building up a sound academic partnership framework could also be good leverage.
- In addition to technologies of civil and dual-use, the focus area of the National Artificial Intelligence Laboratory will also be open to basic and applied research related to defence technologies – according to the needs of the Ministry of Defence – by joining the relevant international research networks and the available European (EDF Programme) tenders for defence technologies.

#### Encouragement of industry-led networking in AI research

The aim is to establish collaboration between the researchers of artificial intelligence and the users of the technology (industry, public administration, healthcare, etc.). When applying the industry-led networking coordinated by the emerging National Artificial Intelligence Laboratory, the goal of the academic sector will be fulfilled, in other words there will be a unified coordination of basic and applied domestic research, as well as the goal of the user community, according to which development is also of significant importance. It is of key importance for the latter that the effects of AI are perceived not only in the technological developments but in the innovations of the models of products and business as well.

- The academic AI competence map will be created
- Implementation of collaborative projects
- Resources shall be assigned to the jointly financed research

### Incubation of start-up companies

The goal is to support the establishment of companies that are able to develop and bring to market more new, even globally scalable, products. The application of proven technologies to specific cases and their sector-specific introduction are particularly important.

- Provision of the open data assets supporting the development
- Creating a network of "Early adopter" partners
- Development of AI-specific accelerators
- Development of AI-specific investment funds
- Sector-specific grants

### Provide a window of opportunity for companies developing custom applications

The goal is to ensure that companies developing the applications receive an increasing amount of orders reflecting the pace of general adoption in the economy, which is one of the most important objectives of the strategy.

- Supporting a spirit of experimentation
- Establishment of AI marketplaces
- Announcement of AI innovation awards
- Cooperation in academic research projects

### Attracting research centres of international organisations to move to Hungary

The goal is to relocate as many research centres using AI technology as possible to Hungary, based on our strengths such as the regulatory environment, good quality research, and the ecosystem, or to ensure that newly established research centres shall be based in Hungary.

- Clear positioning of Hungary in AI
- Establishment of tax incentives
- Foundations for the clear frameworks of the academic partnerships



### 4.1.3 Incentivising uptake – "Widespread use"

Encouraging and supporting purposeful and tailor-made experimentation to gradually integrate already available and proven technologies.

Establishment of an integrated innovation value chain with strong market collaboration.

**Draft KPI:** 200 projects reaching the Proof of Concept, and introduction of 1,000 registered and commercialised AI applications

### Extensive support for experimentation

The goal is to increase AI-related experimentation to implement an increasing amount of "risky" AI development, as well as to cooperate with the professional organisations of industry in favour of the industry-specific transfer of knowledge to the participants in the AI ecosystem.

- Strengthening the organisational culture of experimentation, provision of a market and brokerage function for the participants in the ecosystem in order to find the right partners early by creating marketplaces.
- Provision of consultants and AI trainers for companies to support the organisational learning process related to the introduction of the application.
- Foundation of an AI Experience Centre (MI Élményközpont) and working with existing experience centres to provide a physical and virtual space for experimentation.
- Establishment of special funding opportunities until the "proof of concept" development phase to reduce the cost of experimentation and the risk involved.

### Development of corporate advisory services based on artificial intelligence (chatbots)

Using the opportunities provided by AI in our existing digital economic development measures, supporting access to them, especially in the EDIOP 3.2.1-15 Modern Businesses Programme (MBP) led by the Hungarian Chamber of Com-

merce and Industry (MKIK). Within the framework of MBP, by completing its content and frameworks by the end of 2021. Developing such corporate advisory services based on artificial intelligence (chatbots) that are capable of increasing the scope of the digitally advanced enterprise or enterprises intending to become digitally advanced, along with supporting enterprises already involved. The development can be integrated with the government's planned voice-based artificial intelligence platform.

### Promotion of the application of AI by SMEs

Based on the existing networks for SME development, the goal is to encourage SMEs playing a central role in the Hungarian economy to apply AI.

- Development of the content in the interests of making indispensable information and training available to this special target group.
- Provision of AI trainers with the aim of consultation on the methods of AI application.
- Composition of a prepared package of applications (toolkit) to support the application of AI technology.
- Establishment of opportunities for SMEs to learn from each other, and provision of resources to support SME-specific introduction.



#### 4.1.4 Education, competence development and societal preparedness – “Focusing on human competencies”

We enable our present and future societies to seize opportunities and, if necessary, put their development on a new path.

Preparation of the actors in society and the economy to leverage the opportunities offered by AI and manage the associated risks, utilising the instruments of education and training.

In the course of developing these capabilities, the currently available and potentially expected competences of the market shall be taken into account; therefore, the availability of situational assessments and forecasts of the labour market are required. For this reason, a continuous collaboration is needed between the professional workshops, economic sectors and NES involved in the development.

**Draft KPI:** 300 people with PhD degree involved in an AI research topic or methodology; 8,000 people received adult education (mainly for target groups in manufacturing, healthcare, agriculture, transport and logistics, as well as civil servants and SME leaders)

#### Making knowledge of AI technologies available to the broader society

The goal is to raise the broader society's awareness of AI, to introduce and realise the advantages, disadvantages and risks of AI technologies, which are prerequisites for adopting the technology. In order to support AI uptake, it is necessary to raise awareness of the existence of the new technology and the main features of its operation, as well as to strengthen the “early adopter” attitude.

The use of AI technology without critical thinking may hold potential dangers; the proposals of an opaque algorithm that works as a “black box” must always be considered by the individual users. In order to enable responsible and safe use, it is extremely important to prepare young people for the specific dangers of AI technology, as well as to develop critical thinking. Another key goal is to prepare parents and teachers for the appropriate protection of children.

This shall be done in cooperation with the formal and non-formal education system and professional organisations.

Related action plans:

- Establishment of an AI Innovation Hub (MI Innovációs Központ) for dissemination, information, event organisation and social dialogue, the collection of profession-specific new training needs and their communication to the education system
- Completion of the AI Challenge in Hungary by the end of 2021: – Awareness raising for 1 million people, training 100,000 people by completing a basic AI course, definition of the goals of the awareness period starting from 2022 based on the experience of the AI Challenge
- Programmes available within the framework of public education and vocational training to support students in becoming users of AI technologies (horizontal and modular AI contents in training, collaboration with robots, “kisokos” guides, student competitions, career orientation tenders)
- Preparation of teachers in public education and instructors in vocational training, organisation of further education programmes, awards for teachers taking the lead in the use of AI, experimentation and preparation
- Development of AI-related general knowledge, skills and competencies in higher education among the students, higher education staff and local economic/social actors.
- Intensive use of AI technologies in the developments associated with data management in higher education.
- Preparation for AI related tasks in public education and vocational training in the context of teacher training and higher education in general

#### Competence development and expansion of the expert base required for the uptake of AI

The goal is to reduce the shortage of specialists on the basis of potential customers of AI developments, i.e. to expand the circle of managers who are aware of the technology, and are able to assess the needs of the enterprise, identify potential uses for AI technologies and manage and support implementation processes. Related action plans:

- Start of ECDL type training introducing AI technologies
- Establishment of preparation programmes for the AI application:
  - for the managers of SMEs,
  - for experts in manufacturing, agriculture, healthcare, transport, logistics, energetics and public administration,
- Creation of demand through the recommendation of content, provision of grants for targeted corporate re-training, recommendation of training courses
- Development of data asset management training for those working in public administration

#### Enhancing data specialist, developer and research expert capacity

Another goal is to enhance the data specialist, developer, and research expert capacity necessary for the domestic expansion of AI, and to reduce the current shortage of labour in these fields. Introduction of a professional visa for experts in the field of AI for the purpose of preventing or reducing such a labour shortage in Hungary.

Supervision and development of the content of undergraduate and master's degree programmes in the field of information technology to ensure the expert capacity required for AI developments.

- Introduction and dissemination of the application of AI technologies in research methodology. Promoting and supporting the use of AI technologies in the preparation of research methodologies for doctoral courses.
- Increasing the number of AI-related topics of fundamental research and doctoral dissertations in several branches of science, collecting the AI-related doctoral courses and making them available to PhD students, organising cross-teaching programmes independent from the programme, as well as establishing PhD programmes based on collaboration in the topic of AI.
- Establishing an AI scholarship for doctoral instructors and researchers or expanding the existing higher education / research scholarships with the topic of AI, and providing networking support for fellow researchers

- Promoting cooperation between instructors, researchers and institutions (higher education institutions, research institutes, etc.) in fields related to AI, networking, creating a motivation system for supervisors / mentors, funnelling foreign lecturers and researchers into domestic scientific life
- Attracting doctoral students, instructors, researchers, developers and entrepreneurs working in the field of AI to Hungary; formulating the necessary means for this, thereby growing the available highly qualified workforce.

#### Inclusion and talent coaching for groups at risk of falling behind in the labour market

The aim is to collect, promote and make available Hungarian language versions of personalised learning support products available internationally for people at risk of falling behind (disabled, elderly, digital illiterates, those with a low level of education), using AI technologies, as well as to identify and provide priority development and support for talented people from an early age.

- International collection and Hungarian translation of guidance material prepared for the groups at risk of falling behind in the labour market.
- Continuous dialogue on the development results and the special demands that may be formulated as the development goals.
- Introducing games for improving high-level mathematical and logical skills from an early age and identifying talented children and teenagers.
- Provision of mentors and tutors; online and in-person training for recognised talents and providing support for them beyond the school system.





### Tasks for the education system, with an emphasis on higher education

The above goals must be achieved in the formal education system (public education, vocational training, higher education, adult education) and in non-formal and informal learning, drawing on the considerable synergies existing between them.

Personal competence development with AI support is one of the elements of the transformative programmes included in this strategy, in which the education system, particularly higher education, is expected to play a considerable role.

The tasks of education, specifically, higher education, in the foundation pillar “Education, competence development and societal preparedness” and the transformative programme “Personal competence development with AI support” are presented together in the table below.

Goal \ Relevant subsystem	Education system (formal education)	Other sector (non-formal and informal training)
<b>Making knowledge of AI technologies available to the wider society</b>	<ul style="list-style-type: none"> <li>• Awareness-raising in public education</li> <li>• Awareness-raising in vocational education</li> <li>• Awareness-raising in <b>higher education</b> (a mandatory introductory course for all)</li> <li>• preparation by <b>higher education</b> of teachers in public education and instructors in VET for the new AI awareness tasks</li> <li>• rewards for teachers and vocational instructors</li> </ul>	<ul style="list-style-type: none"> <li>• awareness-raising, dissemination, social communication, organised events</li> <li>• online AI training</li> <li>• Reaching out to 1 million people through the AI Challenge,</li> <li>• rewards for teachers and vocational instructors</li> </ul>
<b>Competence development and expansion of the expert base required for the uptake of AI</b>	<ul style="list-style-type: none"> <li>• preparation of public administration staff for application by <b>higher education</b> (National University of Public Service, NKE)</li> </ul>	<ul style="list-style-type: none"> <li>• ECDL type AI training</li> <li>• preparation of SME managers and experts of high priority sectors for application</li> <li>• operation of a training marketplace</li> </ul>
<b>Enhancing data specialist, developer and research expert capacity</b>	<ul style="list-style-type: none"> <li>• development of basic training programmes in higher education, master’s degree programmes and doctoral programmes, including PhD AI training programmes based on collaborative learning, also making use of online training possibilities,</li> <li>• introducing and promoting the use of AI in <b>higher education</b> in the field of research methodology (training the trainers)</li> <li>• rendering AI-related doctoral courses interoperable in higher education</li> <li>• creating doctoral scholarships in <b>higher education</b> for students of research and development, or enhancing existing scholarships in this regard</li> <li>• developing an incentive system in <b>higher education</b> for PhD supervisors, networking across doctoral schools</li> <li>• making efforts in higher education to involve international instructors and researchers more closely in scientific life in Hungary</li> </ul>	<ul style="list-style-type: none"> <li>• introduction of a professional visa system (MoI) for, and to enable researchers, developers and entrepreneurs with AI expertise to settle in Hungary</li> </ul>
<b>Inclusion and talent coaching for groups at risk of falling behind in the labour market</b>		<ul style="list-style-type: none"> <li>• translation of AI tools into Hungarian for vulnerable social groups</li> <li>• coordination with the group concerned regarding their needs, with the involvement of the Innovation Centre</li> <li>• development of games to attract talented individuals</li> <li>• mentoring, talent promotion for individuals identified as having special talents</li> </ul>
<b>Transformative Programmes for personal competence development with AI support</b>	<ul style="list-style-type: none"> <li>• development of the VET and adult education registry with the aim of developing a training recommendation service aligned to individuals’ goals in life</li> <li>• development of AI-based services to provide assistance in individuals’ progress in their studies in <b>higher education</b>, to facilitate enrolment in courses and provide support for online forms of adaptive learning</li> </ul>	<ul style="list-style-type: none"> <li>• development of apps to provide personalised training recommendations and to motivate users to take up/continue with studies, based on the results of the combination of administrative data from public education, higher education and adult education</li> <li>• development of personal learning assistant, primarily in acquiring basic competences, primarily for social groups facing risks of falling behind in the labour market</li> </ul>



### 4.1.5 Infrastructure development – “Stable and Accessible Infrastructure”

Creating the digital infrastructure of the future as a suitable basis for efforts in research and development.

AI research and development requires the development and maintenance of a single harmonised national infrastructure that enables cooperation between participants, structured in such a way that it promotes and facilitates its operation in the regulatory and ethical framework put in place through AI developments.

#### Identification of resources needed for AI development; exploration of existing resources; assessment and development of necessary capacities

The aims include providing a central infrastructure for the resources required for carrying out research and general development tasks, along with continuous development, as required, and maintenance in the long term, of the resulting infrastructure.

- Providing businesses and institutions with whatever hardware resources they require for their research and development activities, such as specific purpose-built hardware, supercomputers, cloud-based software and/or service systems.
- Centralised collection of national digital data files, data collections, data repositories and data silos etc., making data assets of relevance to AI research and development available and suitable for research and utilisation.
- Providing access to software designed for developing and testing open-access and paid-for AI-related applications. These include, for instance, plugins and software libraries containing ready-made solution components and programmed algorithms for certain facets of AI development.
- Sandbox services; development of highly protected virtual environments for AI-related projects, along with AI testing centres; test environments (testbeds) for standardised tests.

#### Creation of coordinating measures to enable the efficient use of resources for the various user groups of the AI ecosystem

The aim is to meet research institutes’ and users’ AI-related temporary storage and computing capacity requirements in a coordinated way without state-owned participants developing redundant capacity. Setting up and applying quality standards to both users and resources so that the parties involved in cooperation can be assured that the resources they use are in place to promote the achievement of the goals being pursued and that those sharing resources can be assured of the use of their resources in accordance with qualified standards and ethical norms. Suitable standards need to be developed and applied to make sure that the coordinative tools to be developed will enable the relevant domestic systems to join with those in place in the EU and make it possible to open the domestic infrastructure and make use of European resources, thereby facilitating Hungary’s effective participation in AI research and development projects in the EU (Digital Single Market).

- Development of marketplaces to manage resources at meta-level, promote brokerage activities, offer available resources and indicate resource requirements.
- Development of hybrid cloud services for research and development, providing access to a variety of computing capacities and developer applications through a single integrated interface.
- Building an automated access control function to operate the marketplaces, allocate access rights to resources appearing in the marketplaces, connecting infrastructure-type resources through APIs and enabling automated accounting of the resources used.



#### 4.1.6 Regulatory and Ethical Framework – “Reliable, regulated use”

Creation of an effective, efficient, human centered and supportive domestic regulatory environment for the operation of AI, together with the necessary ethical framework; taking the relevant EU legislation into account.

##### Establishing a regulatory and oversight framework to ensure responsible, reliable and human-centred utilisation of the technology’s potentials.

Creation of an effective, efficient and supportive domestic regulatory environment for the operation of AI, together with the necessary ethical framework; taking the relevant EU legislation into account.

##### Creating a regulatory framework for data assets

A general regulatory environment needs to be put in place for data assets with functions such as supporting the AI-related use of public data assets and facilitating the process of turning data into assets (assetization), together with the development of the relevant financial and legal regulations – taking into account the various sectors’ specificities and responsibilities in terms of data processing, as well as the relevant fundamental rights and the international framework of data regulations.

- Creation of a framework law on data assets.
- Introduction of a sector-specific regulatory environment to enable data to be turned into assets and their use for purposes of AI.
- Developing rules to govern the use of public data, along with a concept for and rules on their assetization.

##### Developing an AI regulatory environment (comprising rules on registration, technological entities, responsibility/liability and industry regulations)

The aim is to explore legal constraints on and the regulatory needs of AI development and to make proposals regarding changes to be made to the general regulatory environment, along with improvements to the sector-specific regulatory environment in order to facilitate AI development.

- Continuous monitoring and mediation of the relevant EU rules and other regulations (including developments in legal practice and jurisprudence), participation in the preparation of legal regulations and quick and effective communication of new rules and interpretations to the Hungarian legal system.

- Development of AI registers and laying down requirements to be applied in the most important areas.
- Separation of responsibilities and provision of continuous support for rules and developments.
- Support for the implementation of the AI strategy in terms of statutory rules and ethics.

##### Creating an ethics framework for the AI industry

The aim is to create a Code of Ethics, taking international standards and domestic specificities into account, based on broad consensus and factoring in the work and output of the European Commission, as well as the Ad hoc Committee on Artificial Intelligence of the Council of Europe (CAHAI).

- The development of the required ethics framework will involve specifying what is meant by the term human-centred, identifying ethical AI objectives and development directions and integrating these in a reliable and robust AI framework, as well as developing techniques for asserting and enforcing the rules of ethics.
- Developing an AI Code of Ethics.

##### Creating an Artificial Intelligence Regulation and Ethics Knowledge Centre (hereinafter “MISZET”)

The aim is to create and coordinate an extensive pool of experts to help resolve legal issues and matters of ethics relating to the regulation of artificial intelligence and the implementation of the strategy.



#### 4.2 Sector-specific focus areas

Identification of sector specific development goals in order for Hungary to occupy an increasingly knowledge-intensive position in the global value chain.

Based on Hungary’s economic structure and its strengths and opportunities in digital and industry-specific competitiveness, a number of high priority sectors have been identified, in which concerted efforts shall be made, focusing on the development of AI and on disseminating applications. The focus areas identified, the objectives to be pursued and the tools to be used have been determined with the active participation of experts from the sectors concerned.



##### 4.2.1 Manufacturing and autonomous systems – “Smart, personalised, environmentally conscious manufacturing”

AI process-driven smart manufacturing by small, medium-sized and large enterprises, based on new business models, catering to individual requirements, with environmentally conscious manufacturing technologies.

##### Optimising existing processes

Processes need to be optimised and their operational efficiency needs to be improved with the help of AI; moreover, manufacturing model projects need to be implemented, with a focus on quality, inventory management, workforce, energy and resources used, as well as the availability of tools and equipment.

**Prioritised functions in the short term:** regulating the parameters of production processes, support for on-site decisions; quality control with AI tools, online product testing; layout and process simulation, factory optimisation; predictive maintenance; high-precision indoor and outdoor positioning systems using 5G and AI technology; robotic control support using AI solutions; different applications of artificial vision in manufacturing; creating an open IT architecture for production; manufacturing in the city.

**Prioritised functions in the medium term:** Use of AI in 6G networks and in manufacturing; after-sales product tracking, AI-based data processing, estimating and indication of servicing requirements; drone management in industrial applications (model factory, model area); critical machine to machine (M2M) communication, automated management of the operation of multiple IoT devices and private communication devices in industry (model area); supplier chains, product tracking; optimisation of manufacturing logistics; optimisation of energy management; cybersecurity in manufacturing.

##### Organizing an innovation ecosystem; introducing new business models

Basic and applied research projects need to be organised and aligned to industry requirements centrally, and an innovation ecosystem also needs to be organised (by the National AI Laboratory, currently being established) in order to improve efficiencies and launch new processes in manufacturing. Introduction of an AI maturity model and its measurement across the entire range of production. Growth exceeding that enabled by the organic development of operational efficiency can only be achieved by comprehensively redesigning manufacturing or by constructing a new business model at the manufacturing company concerned.

##### SME transformation projects

Projects facilitating transition in parallel with earlier goals need to be implemented for the SME sector – a key component of the Hungarian economy – if manufacturing SMEs are also to remain competitive.



#### 4.2.2 Data-driven healthcare – “More accurate diagnostics, more effective treatment”

The aims are to achieve, in agreement and cooperation with all stakeholders, the responsible use of the continuously expanding health data assets available in Hungary, to strengthen the diagnostic and curative use of artificial intelligence, to develop and introduce AI-supported medical decision-making and medical devices, and to contribute thereby to an effectively and efficiently operating healthcare sector in accordance with the e-Health strategy.

##### **Making available the existing health data assets and supporting AI research and innovation using such data assets**

The extensive and continuously generated health data assets need to be made available through an up-to-date infrastructure and then utilised with the help of AI, always in observance of the requirements laid down in the GDPR. Another objective is to introduce targeted preventive, screening and decision-making applications drawing on the accumulated data assets. This in turn requires the development of an infrastructure and organisation to support the use of the available health data assets.

##### **Medical AI application development, testing and piloting; spreading of successful applications supported with data**

Spreading of AI-based solutions in medicine and in day-to-day healthcare processes. This may be achieved inter alia by spreading existing successful AI applications, as confirmed by data, for use on a pilot basis.

##### **Improving the efficiency of health administration and management using AI tools**

Support for research with a focus on AI in the context of the National Health Laboratory, incubation of health start-ups and promotion of AI use in capacity planning and administration (e.g. HR, ambulance service, asset utilisation)



#### 4.2.3 Integrated, digital agriculture – “Innovative, data-driven, AI-supported agricultural management”

Implementing and spreading AI developments in support of and coordinated with the digital renewal of the agricultural sector.

##### **Structuring of, providing access to, and developing the existing data assets, improving the supply of data**

The Agricultural Data Framework can be implemented by creating a cloud-based data information platform, making it possible to cover all agricultural producers, one that is capable of recording data from multiple sources, storing them in a farm-based and structured way, making them accessible based on authorisations received from producers (data wallet service). It should also be capable of recording (farm or plant based) producer data as well as government data (for example, from the National Tax and Customs Administration, the National Meteorology Service, the National Food Chain Safety Office, the Hungarian State Treasury, the Land Parcel Identification System) in a framework, as well as processing and storing them in a coordinated and structured way (e.g. AI).



##### **Enhancing the agricultural research and development base and the innovation ecosystem**

Launching the Digital Agricultural Innovation Centre (Hungarian acronym: DAIK) to promote the development of the digital innovation ecosystem and incubate start-ups using AI technologies, along with the Digital Food Chain Research, Development and Innovation Centre in cooperation with agricultural higher education.

##### **Provision of testing environments**

This involves the development of a testing environment for the innovation and testing of robots with the help of AI technologies (e.g. the Mezőhegyesi Ménesbirtok stud farm).

##### **Automation and the introduction and spread of AI applications**

Existing regulations need to be amended and new regulations need to be introduced regarding the use of drones and autonomous machines, and a Digital Agricultural Academy needs to be established to promote the proper use of and encourage the proper application of precision and autonomous machines.

##### **Development of AI-based services**

Crop yield estimation functions and a crop protection forecast service need to be developed, and a National Food Chain Data Supply Centre has to be established.



#### 4.2.4 Public Administration – “Data-driven, service provider state”

The aim is to facilitate electronic access to, and the digitalisation of, public services, with AI being one of the enabling technologies. These developments fit in with the electronic public administration concept and system, a function already working on integration and developing processes, the efficiency of which can be improved and where new channels can be provided with services more effectively. The basic principles applying to electronic administration must be followed in such developments as well, i.e. the aims are to develop and test platform-type solutions that can be recommended to all public bodies, and to promote the use of such solutions.

##### Creating a research cluster focusing on the use of AI applications by public bodies and the central supply

##### Automating public administration processes by means of AI

- Development of chat-based digital one-stop-shop administrative processes.
- Automation of correspondence, chat and telephone communication between administration and customers.
- Increasing the number of self-service transactions through process administration.
- Continued development of the Central Identification Agent (KAÜ).
- Development of administrative formalities through KIOSK terminals and physical robots at specific customer service units.
- Development of automated functions for the adoption of decisions.
- Facilitating online labour market and competency-based workforce agency processes.

##### Introduction of control systems for use by law enforcement

- Continued development of the Robocop programme.
- Development of border protection control systems, along with a comprehensive identification system.
- Criminal prosecution and crime prevention relying on integrated data-based analyses.
- Introduction of existing AI technologies in criminal investigation processes.

##### Development of complex modelling systems to simulate decision-making situations

- Development of simulations required for modelling complex decision-making situations and introduction of instruments enabling rapid response capabilities for the Disaster Management Authority, the Hungarian Defence Forces and law enforcement bodies.

##### Applications and developments for the Defence Forces

- Automation of the processing, and synthesising into information, of big data and information operations, as well as decision preparing and supporting systems.
- Implementation and development of predictive supply systems.
- Development of autonomous systems in all relevant theatres of operations (air, land, space, cyberspace). Development of each side of human-machine cooperation.
- Protection against AI-supported systems in all relevant theatres of operation. Modelling and simulation.
- Developments aimed at protecting and analysing the defence-related elements of National Data Assets.

##### Development of AI capabilities for military and national security purposes

- Development of basic infrastructure for developing and running programmes,
- Development and introduction of AI-based data collecting and processing systems to accelerate the processes whereby decisions are prepared, and
- AI-based support for the cyberspace used for military purposes.

##### Development of systems supporting the oversight of financial and taxation processes

- Improving the efficiency of the processes employed by the State Audit Office, the National Tax and Customs Administration and the banking supervisory authorities by pre-screening items to be investigated and by introducing process automation (software robots, language processing).

##### Development of predictive maintenance processes

- Introduction of predictive maintenance processes, development of the maintenance of real property and movable property elements in public ownership through the development of data-based failure projections and introducing maintenance processes based on such projections.



#### 4.2.5 Energy – “Data-based, personalised energy supply”

Making use of data assets in the energy sector, development of services that can be personalised as a result.

- Integration of smart meters, development of conditions and requisites for data-driven processes.
- Introduction of smart heating cost sharing for apartments using central or district heating services.
- Smart grid development (development of data-driven energy market models).
- Predictive maintenance, autonomous operation.
- Development of smart energy supply and optimisation systems, specifically designed for the various industries.



#### 4.2.6 Logistics – “Supply Chain integrated through AI applications”

Introduction of AI dissemination and education with a comprehensive logistics focus, building up logistics data assets and integrated development of logistics AI applications overarching the entire supply chain.

- Extending various training systems and topics with the involvement of professional organisations, cooperation with VET and higher education institutions, enhancing the acceptance of AI.
- Exploring data assets of relevance to logistics that can be extracted from data supplied by central and local government bodies.
- Development, with the involvement of professional organisations, of a register of AI applications used in supply chains and promoting the spread of AI solutions on a large scale across the entire supply chain.
- Starting a process to harmonise the identification of products and goods, launching a standardisation process.
- Integrated development of the interfacing areas through the supply chain/logistics (e.g. supply of consumers, manufacturing systems, predictive maintenance).
- Developing AI-based services to optimise logistics.



#### 4.2.7 Transport – “Development of real-time management with AI support”

Hungary should become a motor of and international proving ground for the use of AI in the transportation industry.

##### Taking Smart City concepts further – traffic management

Introduction of image-based traffic control technologies and related camera systems in large cities across Hungary. Introduction of real-time traffic management based on the processed information. What with the continuous growth of the global population, the number of cities and the ratio of the urban population, AI-supported urban development can facilitate a shift to a (more) sustainable social and economic system.

##### Development of digital infrastructure based on on-board data transmitters

Installation of sensors on the relevant elements of the transport network along motorways as required for DSRC (WiFi) based data transmission between vehicles and the infrastructure communicating through the 5G mobile network.

##### Public transport developments

Introduction of optimised fleet management solutions to enable the services to be run according to the schedules in place, based on real-time traffic data. Introducing a real-time vehicle tracking solution for users through an application interface dynamically predicting the expected arrival time based on traffic monitoring.



#### 4.3 Transformative programmes

Mobilising goals of outstanding social utility, with direct benefits for all citizens.

Hungary is committed to introducing AI in as wide a field of applications as possible; therefore, in addition to identifying the frameworks, foundations and sectoral focus areas required for introduction, it also specifies challenging comprehensive development programmes that will generate value for individual citizens through the use of AI technologies. The implementation of these – known as transformative – programmes are aimed at profoundly transforming the sectors concerned, as well as promoting the use of AI by society in general. In the course of implementing the transformative programmes, special attention shall be paid to the related direct processes of the labour market and the management of transitions with the cooperation of the organisational units of the NES (National Employment Service).



##### 4.3.1 Self-driving vehicles – autonomous systems

Developing, regulating and widely spreading autonomous systems, with a special focus on the introduction of autonomous vehicles for society.

The aim is to develop a supportive environment through developing regulations, R&D&I and infrastructures together, to enable combined development of the various disciplines of a self-driving ecosystem. Further goals include the development and operation of the most efficient transport system possible – by means of automation,

machine learning and artificial intelligence, along with the development of an operating environment for the self-driving ecosystem in response to global technological and user trends. Developed autonomous vehicle solutions can also serve as a basis for the development of defence solutions.



##### 4.3.2 Health consciousness in a digital world

Preparing citizens to accept the benefits of digital health preservation schemes and the use of AI-supported proposals, and help them steer around possible dangers.

Digitalisation and artificial intelligence present many new opportunities and possibilities in digital health awareness and medicine. Hungary has outstanding achievements in the integration and analysis of patient records, which we continue to improve by developments in the process of elaborating industry focuses. This creates an increasingly wide range of opportunities for supporting doctors and the healthcare sector as a whole and for the development and take-up of artificial intelligence applications.

It is also paramount that citizens become aware of the potential of such possible application methods and make active efforts to preserve or restore their own health. Digitalisation and artificial intelligence offer an ever-in-

creasing range of tools and opportunities for people in this regard; recommending and using these under adequate supervision is in the interest of Hungary and its citizens alike.

The aim is to improve digital health consciousness in Hungary – in line with the e-Health strategy and under the leadership of the health sector's participants – whereby citizens make use of the services that are already available (e-Health Care Cloud Hosting /hereinafter “EESZT”/, patient information) and make active contributions by integrating the data collected regarding themselves, by taking care of data quality (using smart devices, logging their own data) and by using the services available through the analysis of data.

In this context, an extensive awareness-raising campaign shall be launched regarding the importance of health data. In the context of the transformative programme, we shall integrate people's instructions regarding their participation in experimental analyses with the help of their data wallets, together with checking the services available through analysis; and we shall develop a marketplace in which

service providers qualified in accordance with the system to be developed as part of the implementation of the measure are pooled and supervised to enable easier orientation for citizens.



### 4.3.3 Climate-driven agriculture

The goal is to mitigate the effects of climate change, reduce harmful emissions and at the same time increase farmers' income with the help of data-based AI solutions.

Agriculture is more dramatically affected by climate change than other domestic sectors and regions (in terms of both exposure and contribution). The most important direct consequences include extreme weather conditions, quality issues and new types of health risks for plant life, while the most relevant indirect ones include the volatility of global market prices and thus fluctuation in farmers' incomes. Keeping the environment in a sustainable condition is crucial for agriculture, as this is the most important factor of production in the future. AI can facilitate preparations for and help mitigate the adverse impacts of climate change – perhaps even make it possible to reverse some of the processes concerned.

In terms of mitigating/reversing some of the adverse effects of climate change, the agricultural sector is especially profoundly affected by harmful emissions in livestock production (e.g. the ecological footprint of farm animals), plant production (e.g. use of fertilisers) and forestry (e.g. choice of timber species) alike. Hungary must adapt to international regulations; its agricultural ammonia emissions must be reduced by a total of 32% by 2030 in accordance with the relevant EU directives. AI-based optimising solutions relating to plant and livestock production can help to reduce the relevant ecological

footprint together with agriculture's harmful emissions. Moreover, the programme is also aimed at contributing to the achievement of the target figures of additional climate and energy policy documents (National Energy Strategy, National Energy and Climate Plan, 1<sup>st</sup> Climate Action Plan).

In preparation for the negative impacts of climate change, various predictive AI-based analytical methods need to be applied as part of the measures to be taken for protection against the key types of damage – drought, hail, spring frost – and the deterioration of water and air quality. The risks faced by livestock production include an up to 10% decrease in milk production and a 15-50% drop in fertilisation rates during hot periods. The timing of both seeding and harvesting of feed crops can be optimised; any decrease in average yields can be forecast and protection against pest mutation can also be improved with the help of artificial intelligence.

Data-based, AI-supported optimisation of livestock and plant production, as well as forest management, can not only increase farmers' incomes but also reduce harmful atmospheric emissions, as well as the damage caused by diseases and pests.



### 4.3.4 Data wallet and personalized services

Making it as easy as possible for citizens to control the secondary use of data that have been generated in relation to them and to benefit from such transactions.

The goal is to enable citizens to participate, as active and responsible actors, in the data economy where the secondary use of data takes place and to exercise their fundamental rights relating to the protection of personal data. To this end, they need to be enabled to dispose over data pertaining to them and to participate actively and securely in the secondary use of such data.

In this context, we must make it possible for citizens – by applying the provisions laid down in the GDPR, with a particular focus on data portability (Article 20) – to easily and securely decide what analyses they wish to permit to be carried on data recorded about them under business contracts or data they have collected about themselves, and who and for what purposes they wish to make such data available depending on what considerations service providers offer them in exchange, in terms of financial rewards or services. To this end, it is paramount that citizens:

- can keep records of the organisations, the data and the purposes regarding which they have granted their authorisations;
- can actually make data recorded in relation to them available to third persons;
- can easily specify the purposes for which their data can be used;
- can check that their data are actually used for the purposes they have specified;
- are provided with services or financial rewards in exchange for the use of their data for the purposes they have specified;
- participate in the entire transaction at the level of anonymity of their choice.

The purpose of the data wallet initiative is that both companies and private entities are interested in participating – in a transparent way – in the data economy, providing all stakeholders with a regulated framework for maximising the benefits from the accumulation of the data assets, based on the progressive opportunities provided by the GDPR and the PSI II.





#### 4.3.5 AI-supported development of personal competences

Developing personalised, data-driven, and digitally-assisted ways of learning to fully support individual learning paths.

This transformative programme is actually a triple framework for developments in education using AI to facilitate personalised learning and to make sure that the entire education system is focused on the student as its most important participant.

- One of the goals that need to be accomplished is creating a training recommendation service aligned to the individual's objectives in life, based on the offering of public education, VET in higher education and in adult education, as well as the benefits in the labour market stemming from successful completion of such training (e. g. in terms of new positions and/or higher pay). The personalised training recommendation service is based on the extension – through the integration of administrative data – of the career tracking function currently in place in higher education and public education, to VET and adult education.

- Another objective is to introduce an AI-based service providing support in the individual's learning path in higher education. One form of this is providing recommendations tailored to individual students on what courses they should take during the next semester of their studies in order to maximise the proportion of successfully completed studies. Another form is AI-supported recommendation, in the adaptive online learning systems to be spread in higher education training programmes, concerning the next curriculum element based on previously completed studies, to promote their successful completion of studies.
- A third form is the development of what is called a personal learning assistant, primarily in acquiring basic competences, for members of social groups facing disadvantages in the labour market.



#### 4.3.6 Automated administrative procedures in Hungarian

Creation of language processing technology for the Hungarian language and incorporating its potential resources into the support service of public and private customer services, with the intention of safeguarding the Hungarian language and culture in the digital age.

The aim is to create a language technology solution supporting the Hungarian language as well, one that can be integrated in all customer service processes in the way of "zero level support", to facilitate administrative processes. The resulting technology will be key to preserving the Hungarian language culture as well. It may be set as an objective through the cooperation of all elements of the AI ecosystem that all customer service calls (state, public utility, telecommunication, bank, insurance etc.) are res-

ponded to by machines and that the major electronic personal assistant service providers (Siri, Alexa, Google Assistant, Cortana) are available in Hungarian, English language content would automatically be translated at the level of the major foreign languages and a widely usable Hungarian language technology module created. The resulting solutions may also become suitable for security and defence applications.



#### 4.3.7 Energy networks focused on renewable sources of energy

Based on smart meters, the introduction of smart grid technologies and extensive forecasts and projections, more accurate scheduling for generating weather-dependent (and so hard to predict) renewables shall be possible, together with the operation of a power grid relying on them.

One of the key issues in the use of renewable energy sources is how fluctuating energy generation, determined by weather conditions, can be coordinated with growing and increasingly unpredictable consumption. Artificial intelligence can be used in the introduction of forecasting/projection procedures and distribution mechanisms, which can increase the flexibility of energy distribution. A dynamic use of smart meters and remote-controlled energy storage

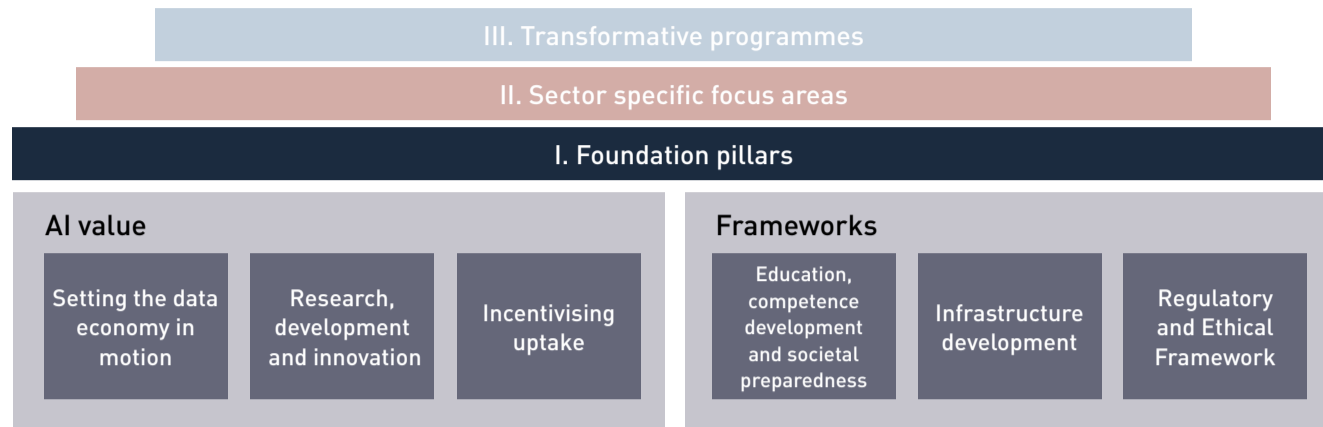
units makes it possible to balance the energy storage capabilities of the entire system. The aim of the programme is to enable, with the help of AI, a shift to a future- and climate-proof form of energy use, making it possible to continuously increase the proportion of energy generated from renewable sources in the total amount of energy generated and consumed.



# 5

## Annexes

### 5.1 Action plan



Setting the data economy in motion			
Measure	Goal	Responsible*	Time frame
<b>Development and operation of the data market</b>	Connecting demand with supply in the market for legally marketable data. The marketplace is to function as a platform for controlled transactions	ITM, AI Innovation Hub	Information level: 31.01.2021 Transaction level: 31.01.2023
<b>Creation of a National Data Asset Agency (hereinafter "NAVÚ")</b>	Adequate utilisation of the public data assets. To this end, supporting public bodies in possession of data assets, in keeping records of data inventories, in making them available for secondary use and in developing their business models. The organisation and the associated public data inventory will be put in place on the basis of the results of projects already completed, projects under way and projects planned to be launched in this particular field.	ITM, IM, NAIH, KSH	The organisations' activities are to be commenced as commissioned, on: 01.10.2020 Launch of public data portal (with usable data content): 31.03.2021 Open access to at least 100 data sets: 31.01.2022 Development of a public data inventory: 31.03.2021
<b>Provision of public funding for free access to high value data asset inventories</b>	Investments and revenue compensations required for open access to public data inventories	ITM, NKFIH, KSH	Proposal for the decision to be made, based on impact assessment: 31.03.2021 making data set with great multiplier effect available: 30.09.2021

Research, development and innovation			
Measure	Goal	Responsible	Time frame
<b>Establishing the National Laboratory for Artificial Intelligence (AI LAB)</b>	Establishing a consortium responsible for the cooperation in the academic sphere and for the conduct of harmonised AI research to meet the requirements of the market; establishment and operation of an organisation system and a partnership framework ensuring that innovation sources are utilised and leveraged	ITM - NKFIH	Founding date of the consortium: 31.12.2020
<b>Establishing the National Laboratory for Autonomous Vehicles</b>	Harmonisation of research and development activities associated with autonomous vehicles and channelling these activities towards actual market demands	ITM - NKFIH	Founding date of the consortium: 31.12.2020
<b>Support for the AI Innovation Hub</b>	Building and development of an accelerator centre for start-ups engaging in the development of or using the achievements of AI	ITM - NKFIH	Date of tender invitation: 31.12.2020 Date of publication of the funds: 31.07.2021
<b>Attracting international AI research centres to Hungary</b>	Moving the AI development departments of companies relocating to Hungary in the country	KKM, ITM	Development of the programme and compilation of the brochure introducing Hungary: 30.04.2021

Incentivising uptake			
Measure	Goal	Responsible	Time frame
<b>Establishing the Innovation Centre for Artificial Intelligence</b>	Building technology training research and infrastructure marketplaces Creation of a team responsible for the support of AI implementation measures specifically aimed at SMEs, Promotion of AI in for SMEs	ITM	Launching the Innovation Centre on the base of the AI Coalition: 01.04.2021
<b>Development of corporate advisory services based on artificial intelligence (chatbots)</b>	Within the framework of the EDIOP 3.2.1-15 Modern Businesses Programme (MBP) already underway, the development of corporate advisory services based on artificial intelligence (chatbots) that are able to increase the scope of the digitally advanced enterprises or enterprises intending to become digitally advanced along with the support companies already involved. The development can be integrated with the planned voice-based artificial intelligence platform of the government.	ITM, MKIK	Supplementing* the priority project EDIOP 3.2.1-15 MBP until 31.12.2020, Realization of AI partial project until 30.03.2022 <small>* Subject to consultation with the EDIOP - Managing Authority (IH) and the government decision regarding the amendment of the Annual Development Funds</small>
<b>Creation of a corporate AI experimental and support fund</b>	Provision of sources to test efficiency-enhancing potential based on AI-based technologies	ITM - NKFIH	Date of fund establishment: 31.07.2021
<b>Establishment of the Innovation Award for the Application of AI</b>	Invitation for tender for awarding the best AI application projects for each category (size + industry) in an annual gala show.	ITM - NKFIH	Date of publication of the award: 31.07.2021

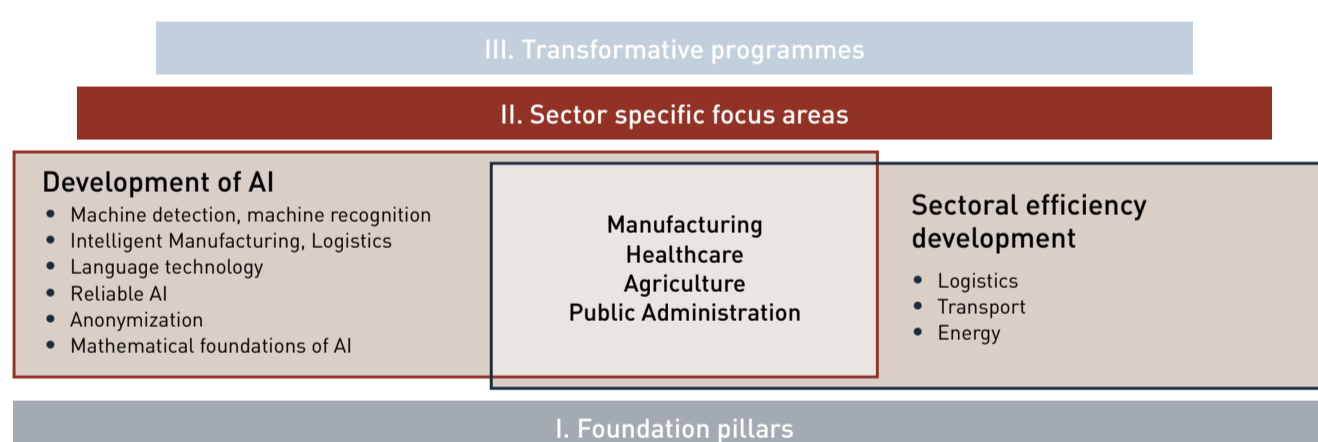
Education, competence development and societal preparedness			
Measure	Goal	Responsible	Time frame
<b>Making knowledge of AI technologies available to the wider society</b>	General preparation in higher education Preparation of the players of society and economy for leveraging the opportunities offered by AI and for the associated risk management, performed within the framework of higher education.	ITM	31.03.2022
	General preparation in public education and vocational training	EMMI, ITM	31.08.2021
	A parent and child protection programme to raise awareness regarding the dangers of everyday use of AI and regarding the right use of the technology	EMMI	31.08.2021



Education, competence development and societal preparedness			
Measure	Goal	Responsible	Time frame
<b>AI Challenge</b>	Training 100,000 people using internationally accredited online course material, Raising awareness of 1 million people via interactive exhibitions, a website and online professional contents	ITM, AI Innovation Hub	Start of challenge: 01.11.2020
<b>Provision of expert capacity regarding the pertinent fields of specialisation</b>	To make potential AI customers understand the technology and to enhance capacity regarding the management of the realisation process	ITM, AI Innovation Hub	31.03.2021
	Training experts in the priority sectors and public administration	ITM, AI Innovation Hub, EMMI, BM	31.12.2021
	Preparation to provide suitable specialised training for professions expected to emerge in the future	ITM, AI Innovation Hub	31.12.2021
	Development of teacher training in line with the pertinent provisions of the National Basic Curriculum and the framework curricula.	ITM, EMMI	31.12.2022
	Provision of a highly qualified expert capacity in higher education to facilitate AI developments	ITM, higher education insitutions	31.12.2022
	Intensive use of AI technologies in the developments associated with data management in higher education	ITM, Education Authority, higher education insitutions	31.12.2022
	Collection and cleansing of data, data disclosure management for the availability of the necessary data, capacity development of data engineer competencies	ITM, AI Innovation Hub	31.12.2022
	Preparation for future professions in higher education, promotion of career opportunities in public administration	ITM, BM – NISZ, Idomsoft Zrt., higher education insitutions	31.12.2021
	Enhancing developer capacity, provision of continuous professional growth	ITM, AI Innovation Hub	31.12.2021
	Enhancing data specialist, developer and research expert capacity in higher education	ITM, higher education insitutions	31.12.2022
<b>Development of mathematical and IT competences</b>	Enhancing high-level mathematical and IT researchers' competencies for basic and applied research	ITM, AI Innovation Hub	31.03.2021
<b>Personalised learning methods</b>	Personalised learning methods (using AI technology) for supporting people exposed to the risks of falling behind in the labour market and for supporting the talented (HUF 0.5 billion)	ITM, EMMI, BM, AI Innovation Hub	Development of the detailed project proposal: 31.12.2020

Infrastructure development			
Measure	Goal	Responsible	Time frame
<b>Enhancing supercomputer capacities</b>	As of 2022, the availability of 5 petaflops HPC capacity in Hungary	ITM, KIFÜ	31.03.2022
<b>Development of Hungarian testing environments</b>	Further development of testing environments, in particular connection to the European testing environment systems in the fields of self-driving vehicles, smart cities, agriculture and manufacturing Encouraging international cooperation opportunities and provision of the necessary conditions Network testing for PPRD and 5G purposes, testing the government-owned smart settlement platform and infrastructure	ITM, BM, ZalaZone	Accreditation of ZalaZone as a European testing environment: 31.03.2021 Accreditation of the agrarian model farms as a European testing environment: 31.03.2021
<b>Development of infrastructure marketplace</b>	Inventory of infrastructures Development of an infrastructure request protocol Integration into AI marketplaces	ITM, KIFÜ, KSH	Inventory of infrastructures: 31.12.2021 Development request protocol: 31.12.2021 Integration into AI marketplaces: 28.02.2021
<b>Hybrid cloud development for research purposes</b>	Ensuring the availability of research hardware and software modules with cloud service providers, Development of a masking system that is capable of the integrated provision of a development environment for researchers working with various types of clouds	ITM, KIFÜ, KSH	Launch of hybrid cloud: 30.09.2021
<b>Realisation of large computing capacity data centre developments, application of AI</b>	Further development and creation of new operational, information security, optimisation and load distribution capabilities to support and supplement new capacities resulting from already existing capacities and further development	BM - NISZ	31.12.2025
<b>Building an automated access control system to operate marketplaces</b>	Implementation of a workload distributor and resource monitoring device to ensure optimal capacity use	ITM, KIFÜ	Start: 30.09.2022

Regulatory and Ethical Framework			
Measure	Goal	Responsible	Time frame
<b>Building a comprehensive data management environment</b>	Data asset regulation - building the regulatory environment regarding general data assets - regulatory framework system regarding public data - building the financial and legal system of rules regarding data monetisation	IM, ITM, NAIH, KSH	31.12.2020
<b>General regulatory framework system regarding AI</b>	- amending the general regulatory framework system to suit AI - building the Hungarian regulatory environment - connecting to the EU regulatory system and implementation - involvement in the legislative activities of the European Council and international organisations, implementation	IM, ITM, NAIH, KSH	30.06.2021
<b>Development of the regulatory framework system regarding the AI sector</b>	Building a comprehensive industry regulatory environment: - Healthcare - Education - Financial (bank) sector - Regulation of autonomous vehicle systems and their traffic rules - Fields of sustainable development - Agriculture, food industry - Leveraging research data assets	IM, EMMI, PM, ITM, AM, BM, HM, NAIH, KSH	30.06.2021
<b>Drafting an AI code of conduct</b>	Creation of an ethical framework system	ITM, AI Innovation Hub, IM, KSH	30.04.2021
<b>Creation of the Artificial Intelligence Regulation and Ethics Knowledge Centre</b>	Provision and coordination of a wide-ranging base of experts to support regulatory and ethics-related tasks.	ITM, IM	30.10.2020



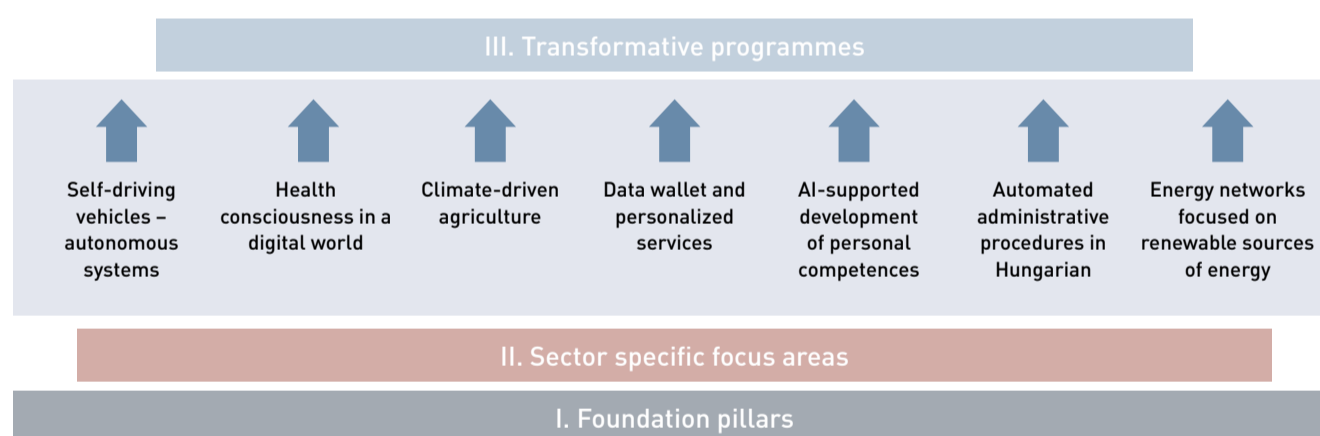
Manufacturing technologies			
Measure	Goal	Responsible	Time frame
<b>Support for AI model projects</b>	Invitation for a tender to support the financing of especially useful model projects (optimisation of manufacture, identification of scrap, maintenance forecast, etc.)	ITM - NKFIH	Invitation for the project grant tender: 30.04.2021
<b>Building of a manufacturing testing environment and integration into the EU</b>	Building a testing environment capable of presenting manufacturing data analysis Exhibition of model applications Grant for circular/green manufacturing	ITM	Setup of a test and model environment: 30.06.2021
<b>Data processing and data protection associated with manufacturing</b>	Development of cyber and data protection in manufacturing Implementation of data standardisation protocols to enable data analysis Introduction of manufacturing data in the data market	ITM, AI Innovation Hub	Cyber protection recommendations and standards: 21.03.2021 Data market integration: on an ongoing basis
<b>Maintenance of a manufacturing - AI research ecosystem</b>	Cooperation with the AI LAB in key research topics Introduction of players available in the ecosystem in the AI marketplace Organisation of applied research and active organisation of an innovative value chain	ITM, AI LAB	Specification of the AI LAB manufacture-research programme: 31.07.2021
<b>Development of competences regarding the application of AI in manufacture</b>	As part of the nationwide campaign, organisation of manufacturing-specific training and case study compilations Drafting a production readiness model	ITM, AI Innovation Hub	Completion of manufacturing-specific AI training material: 30.04.2021 Drafting an AI readiness model in the field of manufacturing: 28.02.2021

Healthcare			
Measure	Goal	Responsible	Time frame
<b>Making available the existing health data assets and supporting AI research and innovation using such data assets</b>	Creation of an infrastructure and organisation that supports leveraging healthcare data assets; creation of the pertinent legislation environment	EMMI, BM, KSH	Drafting a detailed action plan: 31.03.2021
<b>Development of AI applications in the fields of prevention, screening and diagnostics</b>	I. imaging diagnostics, II. focused, preventive screenings based on the analysis of central files, III. therapy and diagnostic decision support, IV. improving the efficiency of pharmaceutical research and support for <i>in silico</i> experiments V. development of medical technology equipment	EMMI	Drafting a detailed action plan: 31.03.2021
<b>Introduction to medicine</b>	Introduction of existing applications to medicine (distribution of some own developments within the framework of pilot projects)	EMMI	Drafting a detailed action plan: 31.03.2021
<b>Introduction to the supply process</b>	Distribution of AI applications suitable for implementation in daily supply processes	EMMI	Drafting a detailed action plan: 31.03.2021
<b>AI support for capacity planning</b>	AI-supported capacity planning and administration support (e.g. HR, backup files, equipment capacity management)	EMMI	Drafting a detailed action plan: 31.03.2021

Agriculture			
Measure	Goal	Responsible	Time frame
<b>Establishing an agricultural data framework system</b>	Creation of a conscious data processing option for the entire farming community to support efficient technological and business decisions and to reduce red tape. Structured collection and analysis of plant-level and environmental data to allow the efficiency of government operations to be enhanced and to develop innovative enterprises providing services to data users or farmers.	AM, KSH	2020-2023
<b>Expediting land reparcelling processes by creating exchange chains</b>	Creation of an AI-supported exchange chain allowing scattered land parcels to be reallocated next to each other based on agreed exchanges	AM	System establishment: 30.06.2021 Exchange processes: 30.06.2022
<b>Creation of a plot-based and data-driven farming consultancy service</b>	Based on the data originating from meteorological and spatial images or local farming, establishing a central recommendation system and simple-to-implement, data-based advisory services	AM	Launch of the advisory services: 30.06.2022

Public Administration			
Measure	Goal	Responsible	Time frame
<b>Establishing an AI research cluster in public administration</b>	Creating a research cluster focusing on the use of AI applications by public bodies and central supply	BM	31.03.2022
<b>Using AI for the automaton of public administration processes</b>	Delivery of and support for chat-based digital one-stop-shop solutions Automation of correspondence, chat and telephone communications with clients Expansion of the scope of cases covered by process-automation enabling self-service Establishment of client communication options through KIOSK terminals. Development of automatic resolution adoption functions. Development of data analysis and data processing solutions and extraction of information necessary for running errands or making decisions in a readable and understandable format. Development of competences, training courses, continuation training Provision of the necessary infrastructural environment.	BM - NISZ	Drawing up the detailed project proposal: 31.03.2021 Based on the project plan, the final deadline for completing individual activities and developments is 01.10.2023
<b>Introduction of control systems for use by law enforcement</b>	Continued development of the Robocop programme Development of border patrol systems, establishment and further development of a comprehensive identification system Criminal prosecution and crime prevention relying on integrated data-based analyses Development of support functions and the associated administration and legislative tasks Using AI, mapping offender networks and further development of the graphical database Introduction of existing AI technologies to the investigation process Provision of speech-to-text, text-to-speech and language technology functions, system integration, analysis of digital documents and speech recorded during client communications using text mining tools, data processing Automaton of manual data management and processing processes Support for data management and -processing activities associated with documents Development of competences, training courses, continuation training Provision of the necessary infrastructural environment	BM	Drawing up the detailed project proposal: 31.03.2021 Completion of the project: 31.03.2024
<b>Standardisation activities in public and local government administration</b>	Start of standardisation in the operation of public- and local government administrations, their implementation and support, identification of key areas, EU cooperation opportunities	ITM, BM	31.03.2025
<b>Development of complex modelling systems to simulate decision-making situations</b>	Development of simulations required for modelling complex decision-making situations and the introduction of instruments enabling rapid response capabilities for the Disaster Management Authority, the Hungarian Defence Forces and law enforcement forces	BM, HM, MH	Drawing up the detailed project proposal: 31.03.2021
<b>Development of systems supporting the oversight of financial and tax processes</b>	Pre-screening of items to be audited and implementation of process automation (software robots, language processing) to enhance the efficiency of SAO, NTCA and bank supervision processes	PM, BM, MNB, KSH	Drawing up the detailed project proposal: 30.06.2021
<b>Implementation of forecast-based maintenance processes</b>	Introducing data-based malfunction forecasts and implementation of the indicated maintenance processes in order to develop the maintenance of movable and immovable public assets	ITM	Drawing up the detailed project proposal: 30.09.2021

Public Administration			
Measure	Goal	Responsible	Time frame
<b>Developing AI capabilities for military and national security purposes</b>	Development of basic infrastructure for developing and running programmes, Development and implementation of AI-based data collection- and processing systems, AI-based support for the cyberspace used for military purposes.	KNBSZ	Drawing up the detailed project proposal: 31.03.2021
<b>Defence applications and developments</b>	Automation of big data processing, synthesizing into information, information operations and decision preparation and support systems, Implementation and development of predictive supply systems, Autonomous systems in all relevant operational theatres (air, land, space), Development of human-machine cooperation from both sides Protection against systems supported by AI Modelling and simulation Developments aimed at protecting and analysing the defence-related elements of the National Data Assets.	HM, MH	Drawing up the detailed project proposal: 31.03.2021
Logistics			
Measure	Goal	Responsible	Time frame
<b>AI-based unification and standardisation</b>	Initiating the standardisation of the solutions used for the identification of products and goods.	ITM	Drawing up the detailed project proposal: 31.05.2021
<b>Integrated AI development of the fields associated with logistics</b>	Integrated development of the interfacing areas through the supply chain/logistics (e.g. supplying consumers, manufacturing systems, predictive maintenance)	ITM	Drawing up the detailed project proposal: 31.03.2021
Transport			
Measure	Goal	Responsible	Time frame
<b>Extension of smart city concepts - traffic control, traffic management</b>	AI-based, automatic traffic management to reduce traffic jams Development of smart parking systems Support for achieving the strategic traffic management and traffic policing policy objectives	ITM, BM	Drawing up the detailed project proposal: 31.03.2021
<b>Building a digital infrastructure facilitating the use of on-board data transmission devices</b>	Integrated analysis of signal data originating from data transmission devices, recognition of data patterns, support for self-driving vehicles by improving V2V communication, enhancing traffic safety	ITM, ZalaZone	Building a digital infrastructure 31.03.2022
<b>Public transport developments</b>	Optimisation of urban public transport networks, passenger counts, journey optimisation	ITM, BKK, MÁV, Volán	Building a digital analytics platform: 30.09.2021
Energy			
Measure	Goal	Responsible	Time frame
<b>Integrating smart meters, developing the conditions and requisites for data-driven processes</b>	Increasing the number of multi-time zone, flexible pricing services offered and used by 1 million electricity users equipped with smart meters	ITM	2030
<b>Implementation of predictive maintenance and autonomous operation</b>	Analysis of network data sets to predict the maintenance activities to be completed in energy public utility networks	ITM	Development of competences necessary to analyse big network data concerning maintenance by 2025



Self-driving vehicles – autonomous systems			
Measure	Goal	Responsible	Time frame
<b>Building the infrastructure- and regulatory framework necessary for the operation of autonomous transportation systems</b>	Harmonising domestic and EU legislative environments and traffic police regulations. Nationwide road development to contribute to the self-driving infrastructure	ITM, BM	Equipping single-digit road networks with self-driving infrastructure by 2025

Health consciousness in a digital world			
Measure	Goal	Responsible	Time frame
<b>A campaign promoting the use of healthcare data</b>	A campaign promoting awareness, own collection and responsible use of possible healthcare data using applications linked to the data wallet app	EMMI, ÁEEK, ITM	Start of the campaign: 31.03.2021
<b>Opinions regarding the use of healthcare data</b>	Adopting a legal opinion with regard to the options of secondary use of own or self-collected healthcare data	EMMI, BM, ITM, KSH	31.12.2023
	Assessment of activities of businesses engaging in illegal data management, assessment and deploying the tools of enforcement measures against these activities, reducing the number of information security incidents, enhancing data protection and integrity of data.	EMMI, ÁEEK, BM, ITM	ongoing
<b>Drafting of rating systems for healthcare data analytics applications</b>	Mapping digital healthcare applications, developing rating criteria and monitoring processes, communicating the rated service providers	EMMI, ÁEEK, ITM	30.06.2021

Climate-driven agriculture			
Measure	Goal	Responsible	Time frame
Preparing for the impacts of climate change and mitigating its adverse effects	Development and application of AI-based, optimisation solutions in terms of plant production and stock farming	AM	Drawing up the detailed project proposal: 31.12.2020
	Implementation of predictive, AI-based analytics methods to improve water, soil and air quality to enhance the efficiency of management	AM	Drawing up the detailed project proposal: 31.12.2020

Data wallet and personalized services			
Measure	Goal	Responsible	Time frame
Development of the data wallet technology model	Development of software to support citizens in making statements regarding the use, sale or disclosure of their data to third parties in a one-stop-shop system. Integration of Hungarian patents to allow fully anonymous accesses.	ITM	Preparation of the first demo model: 31.12.2020 Building the model providing full anonymity: 28.02.2022
Provision of legal oversight	Management of measures monitoring requests granted under Art. 20 of the GDPR and managing the increasing legal redress requests Issue of positions taken regarding the possibilities and recommended guidelines on compensations to be provided to service providers and citizens upon the disclosure of data collected by service providers	ITM, NHIT, NAIH	Issue of an official opinion on the expectations regarding data wallet compatibility: 31.12.2020 Recommendation on the distribution of the proceeds of data sales: 31.12.2020
Support for businesses present in the market for attaining compatibility with the data wallet	Establishment of a grant fund intended for market players (primarily for SMEs)	ITM - NKFIH	Completion of the tender concept: 30.06.2021

AI-supported development of personal competences			
Measure	Goal	Responsible	Time frame
AI-supported career advisory system	Development of the necessary files, expert activities, ensuring interoperability of file systems	ITM, Education Authority	Drawing up the detailed project proposal: 30.06.2021
	Development of a personalised training recommendation service that is tailored to individual life objectives and based on public education, vocational training, tertiary vocational training and adult education offers, along with the labour market results attained by their completion	ITM, AI Innovation Hub	Drawing up the detailed project proposal: 30.06.2021
Identification of learning path recommended in the training	Within the training, establishing a service offering training content or courses allowing the completion of a customised learning path	ITM, AI Innovation Hub	Drawing up the detailed project proposal: 30.06.2021
Learning assistant	Development of a personal learning assistant, primarily for those who are exposed to the risks of falling behind in the labour market in terms of the acquisition of basic competences	ITM, AI Innovation Hub	Drawing up the detailed project proposal: 31.12.2020

Automated administrative procedures in Hungarian			
Measure	Goal	Responsible	Time frame
Collection of training datasets	Collection of corpuses necessary for developing the processing of the Hungarian language by machines for both oral and written text materials	ITM, BM	Corpus compilation: 31.07.2021
Automaton of the multi-channel customer service processes used by nationwide telephone-based customer services using AI solutions	AI support for human email, chat and voice communication	BM - NISZ	Launch of pilot: 31.03.2021
Support for implementation in customer services	Expansion to government administrative matters Invitation for tenders for the development of AI-supported customer services and for building the 1818 Government Client Hotline and for cooperation regarding infocommunications	BM - NISZ, ITM - NKFIH	Launch of wide-scale promotion: 31.12.2022

Energy networks focused on renewable sources of energy			
Measure	Goal	Responsible	Time frame
Implementation of Smartgrid technologies	Building upon smart meters, the implementation of smartgrid technologies and wide-scale forecasts, we shall facilitate the creation of a more accurate production timeline for weather-dependent renewable energy sources and the operation of the energy network relying on it	ITM	Implementation of a new network development and network connection regulation by 2025 to support an efficient system integration of the production of renewable energy

\*Note that in the above table the abbreviations and acronyms of responsible institutions are the Hungarian versions. The following table contains english translations for these.

Hungarian acronym/ abbreviation	Hungarian name	English name	Hungarian acronym/ abbreviation	Hungarian name	English name
ÁEEK	Állami Egészségügyi Ellátó Központ	National Healthcare Service Center	MÁV	Magyar Államvasutak Zrt.	Hungarian State Railways
AI LAB	MI Nemzeti Labor	AI National Lab	MH	Magyar Honvédség	Hungarian Defence Forces
AM	Agrárminisztérium	Ministry of Agriculture	MKIK	Magyar Kereskedelmi és Iparkamara	Hungarian Chamber of Commerce and Industry
BKK	Budapesti Közlekedési Központ	Centre for Budapest Transport	MNB	Magyar Nemzeti Bank	Central Bank of Hungary
BM	Belügyminisztérium	Ministry of Interior	NAIH	Nemzeti Adatvédelmi és Információszabadság Hatóság	National Authority for Data Protection and Freedom of Information
EMMI	Emberi Erőforrások Minisztériuma	Ministry of Human Capacities	NISZ	Nemzeti Infokommunikációs Szolgáltató Zrt.	National Infocommunications Services Ltd. (under Ministry of Interior)
HM	Honvédelmi Minisztérium	Ministry of Defence	NKFIH	Nemzeti Kutatási, Fejlesztési és Innovációs Hivatal	National Research, Development and Innovation Office
Idomsoft Zrt.	Idomsoft Zrt.	Idomsoft Ltd.	OH	Oktatási Hivatal	Educational Authority
IM	Igazságügyi Minisztérium	Ministry of Justice	PM	Pénzügyminisztérium	Ministry of Finance
ITM	Innovációs és Technológiai Minisztérium	Ministry for Innovation and Technology	Volán	Volánbusz Közlekedési Zrt.	VOLÁNBUSZ Transport Company Ltd. (100% state owned public transport provider)
KIFÜ	Kormányzati Informatikai Fejlesztési Ügynökség	Governmental Information Technology Development Agency	ZalaZone	ZalaZone zalaegerszegi tesztpálya	ZalaZone Zalaegerszeg test track (proving ground for vehicular R&D)
KKM	Külgazdasági és Külügyminisztérium	Ministry of Foreign Affairs and Trade			
KNBSZ	Katonai Nemzetbiztonsági Szolgálat	Military National Security Service			
KSH	Központi Statisztikai Hivatal	Central Statistical Office			

