Estonia's National Artificial Intelligence Strategy or Kratt Strategy for 2022–2023

Contents

Introduction

This **Artificial Intelligence Strategy is a continuation of Estonia's previous national artificial intelligence strategy implemented in the period of 2019–2021**. While at the time of the preparation of the 2019–2021 Artificial Intelligence Strategy, the development of the field was slow and the public sector was just starting to implement its first projects, the use of artificial intelligence (AI) has now become an essential and unavoidable part of the development of the digital state. While in 2018, four AI projects had been carried out by four public sector bodies, **today more than 80 AI projects have been performed, more than 40 organisations have been involved, and a number of AI groups have been developed, allowing easier implementation by both the private and public sector**. In order to achieve the objectives, support was provided to the authorities in the development of the AI solutions, a cooperation network was launched, training was carried out, and the area of data management and open data was further developed. At the same time, there were no AI-specific activities in the private sector, except for support for the digitisation and robotisation of services more generally. **On the R&D side, the IT Academy's research action, including AI topics, had already been launched, and the Ministry of Education and Research (MER) had strategically supported the development of Estonian language technology since 2006. In the area of shaping the legal framework, the 2019–2021 AI Strategy aimed to develop a package of the 'AI laws' to enable the deployment of AI.** As part of this, an intention to develop a regulation on the effects of algorithmic systems (the so-called 'AI VTK') was drafted with the aim of identifying possible changes to existing law to accommodate the introduction of AI. Since, after the development of the AI VTK, the European Union launched an initiative to create a harmonised EU-wide regulation on AI, the legislative activity was redirected towards specific problems that require regulatory intervention independently of EU action. **The budget for the 2019–2021 AI Strategy activities was around EUR 10 million.**

This **AI Strategy provides an overview of the activities planned to increase the use of AI in Estonia and thereby increase the user-friendliness and accessibility of e-services and the efficiency of the state.** In doing so, the AI Strategy will reflect actions to ensure that the principles of human-centred and trustworthy AI are followed. The strategy addresses the introduction of the AI solutions in both the public

and private sector and in education and research, as well as the necessary legislative amendments for 2022–2023, and is largely a continuation of the 2019–2021 strategy. **The main objective of the public sector activities is, on the one hand, to support the creation of a base capacity for the deployment of the AI solutions in those public sector bodies that have not yet deployed the AI and, on the other hand, to consolidate and empower those bodies that already have a base but have not deployed it.** In addition, **'data as enabler' is a new stand-alone focus area in this AI Strategy**, which aims to support more broadly the data findability, reusability, and quality of data in both the private and public sector. **Private sector activities will focus on raising awareness** of the potential of AI to add value to businesses and on providing support to those capable companies already willing to develop and test AI-based solutions. **From the perspective of education and R&D, there will be a stronger focus on developing competences and skills**, continued support for AI R&D, and Estonia will have access to world-class supercomputing resources.

The AI Strategy was set up under the management of the Ministry of Economic Affairs and Communications (MEAC), in cooperation with the Ministry of Justice (MJ), and the Ministry of Education and Research (MER). The AI Strategy was supplemented and provided with feedback by the rest of the ministries and the main partner organisations (Estonian Association of Information Technology and Telecommunications, universities, private companies, sub-agencies of the ministries, AI-based consortia of companies and universities, science parks, etc.). The strategy has been established for two years to allow for the necessary response to such a rapidly evolving area. The AI Strategy is an action plan that contributes to the implementation of a number of courses of action arising from several national development plans (including the Digital Society Development Plan until 2030, the Research and Development, Innovation and Entrepreneurship Strategy 2035, the Education Strategy 2035, etc.). The implementation of the strategy will be managed and monitored on an ongoing basis by a steering group chaired by the MEAC and composed of representatives of public authorities and key partners; it also discusses and plans additional activities as necessary. Once a year, the implementation of the strategy will be reported to the steering group of the Digital Society

Development Plan and the steering committee of the Research and Development, Innovation and Entrepreneurship Strategy. At the end of the AI Strategy, an analysis of the activities undertaken and their results will be carried out.

The financial volume of activities included in the strategy reflects the available funding (i.e. covered by the national budget) for the different activities, not the needs. **In accordance with this strategy, Estonia will contribute at least EUR 20 million from 2022–2023 to the implementation of the AI Strategy in different directions.** This will be accompanied by measures to support digitisation more generally in the amount of EUR 100 million, under which, among other things, it will be possible to apply for funding on a competitive basis for AI-related topics.

This AI Strategy for 2022–2023 is simultaneously Estonia's national AI strategy in the sense of the Coordinated Plan on Artificial Intelligence of the European Union.

AI Strategy for 2022–2023

Public sector

Overview:

When the drafting of Estonia's National Artificial Intelligence Strategy was launched in 2018, public sector organisations had little experience with the implementation of AI solutions, initially limiting themselves to a few projects. On this basis, the aim of the 2019–2021 AI Strategy was to establish the necessary baseline capacity for deployment, gain initial experience, and decide on future actions and targets. In line with the objectives of the strategy, the aim was to measure its implementation by the following key performance indicators (the target levels for the indicators were as at 31 July 2021):

1. Number of AI solutions deployed in the public sector: 50, baseline: 4
2. Number of public sector institutions that have deployed the AI solutions: 25, baseline: 4
3. Published AI groups: 5, baseline: 0

By now, Estonian public sector organisations have gained extensive experience in the use of AI solutions. In the public sector, more than 80 AI projects have been carried out, more than 40 organisations have been involved, and a number of AI groups have been developed to facilitate implementation in both the private and public sector. This is illustrated by the current state of implementation of the indicators of the strategy (as at 1 November 2021):

1. Number of AI solutions deployed in the public sector: 80
2. Number of public sector institutions that have deployed the AI solutions: 40
3. Published AI groups: 7

As the implementation of the AI solutions has been wide-ranging and involved many public sector bodies, the preparation of the new AI Strategy involved the involvement of almost 50 stakeholders and mapping of existing solutions, challenges and targets for the

implementation of the AI solutions and possible measures to support implementation. The following were identified by the organisations as the main challenges and the resulting solutions:

Challenges	Solutions
1. Expectations from the business side of the application of the AI solutions cannot be met with today's level of technology;	1. Competence and capability;
2. There is a lack of IT support, resources, and commitment to projects;	1. Competence and capability; 2. Carrying out the work;
3. Public authorities do not have sufficient support for the development, deployment, and subsequent management of the AI solutions;	1. Carrying out the work;
4. There is a lack of overview of measures and initiatives to support implementation;	1. Competence and capability;
5. Organisations lack the competence and experience to assess the quality of data and how to pre-process data;	1. Competence and capability; 2. Data as enabler;
6. There is a lack of detailed overview of the solutions, tools, and co-developments that have been made, and the same solutions are being developed;	1. Central solutions and initiatives;
7. There is a lack of legal certainty about the processing of data, which delays project implementation;	1. Data as enabler; 2. Legislative drafting;

8. Not being able to see how to implement the AI in the existing information systems and business processes.	1. Competence and capability; 2. Carrying out the work.

The aforementioned activities are further sub-divided into public-sector based actions and horizontal private-public cross-cutting actions, the latter of which are separately identified in the 'data as enabler' block of activities.

Strategic objectives:

Based on the current state of play, the main objective of the strategy in the public sector direction is, on the one hand, to support the baseline capacity for the deployment of the AI solutions in institutions that have not yet deployed the AI and, on the other hand, to consolidate and empower institutions that already have the baseline in place today but have not deployed the AI permanently. Among these, the aim is to apply the AI to the digital services with the highest use and impact. In addition, the aim is to introduce human-centred and trustworthy AI principles in the development and implementation of the AI in Estonia. In line with the approach provided in the strategy, the aim is to measure its implementation by the following key performance indicators (the target levels for the indicators as at 31 December 2023 are):

1. Number of AI solutions deployed in the public sector: 130, baseline: 80
2. Ten of the most used digital services have an AI component: 10, baseline: 0
3. Number of public sector institutions that have deployed the AI: 60, baseline: 40
4. Published AI groups, source code, and binaries: 40, baseline: 6
5. Number of public sector institutions that have deployed the AI based virtual assistant called Bürokratt: 10, baseline: 0
6. Number of public services provided through the AI based virtual assistant called Bürokratt: 15, baseline: 0
7. Speech recognition accuracy in Estonian: 91%, baseline: ~85%
8. Number of training participants: 1,400

Public sector based activities

Competence and capability				
Activity	Result	Responsible authority	Term	Budget
1.2 Organisation of a data protection panel under the auspices of the MEAC and with the involvement of the Data Protection Inspectorate (DPI), and the MJ	The aim of the data protection panel is to support the lawful and legitimate processing of personal data on the one hand, and to help find solutions to problems that arise on the other. The data protection panel will allow authorities to share experiences and concerns and discuss common objectives and initiatives. Activities planned: - March 2022 will see the first panel - Coordination of the activities of the data protection panel	MEAC / DPI / MJ	- March 2022 concept development (target 2022 II half launch) Ongoing activities in the future	---
1.3 Commissioning systemic 'data literacy' training and outreach to raise wider awareness	Making data-driven decisions and processing data requires basic data literacy. The aim of the training courses is to raise the level of data literacy in the public sector among different target groups. Activities planned: - Concept development - Commissioning training and information	MEAC	- April 2022 concept development (target 2022 II half launch)	EUR 260,000

	- Disclosure of 'data literacy' material			
1.4 Provision of centralised training and guidance to contractors, specialists, developers, and managers of the AI projects	The establishment of practical training courses and guides will aim to raise awareness of sustainable implementation, procurement and project management of projects with a AI component, and thereby support the implementation, deployment, management, awareness of cybersecurity requirements, awareness of implementation, dissemination of results, and benefits. Activities planned: - Setting up of role-based competency models and training programmes - Setting up a roadmap of training courses and updating it on an ongoing basis according to user feedback - Ongoing commissioning and delivery of training courses	MEAC / MJ	31/12/2023	EUR 80,000

Central solutions and initiatives				
Activity	Result	Responsible authority	Term	Budget
1.5 Development and implementation of the AI based virtual assistant called Bürokratt	The aim of the Bürokratt is to enable virtual assistants to use public services and interact with the state, thereby radically simplifying the way people do business with the state. Activities planned: - Development and implementation of the basic platform of the Bürokratt in institutions according to the development roadmap	MEAC / Information System Authority (ISA)	Ongoing activity	EUR 6,300,000
1.6 Development of the concept of privacy-enhancing technologies	The use of privacy-enhancing technologies aims to ensure that data is processed responsibly and in accordance with data protection principles, including in the implementation of the AI. Activities planned: - Concept development in cooperation with private and public partners - Implementation of projects based on the concept	MEAC / ISA / MJ	- 2022 II half (target 2023 I half carry out the first projects)	Emerges from the concept

1.7 Agreement and implementation of the activities, role allocation, and concept of a cyber defence centre to support the development and implementation of AI	In order to support the implementation of crypto-systems in institutions that meet the requirements of, among other things, human-centric and trustworthy AI systems, it is necessary to provide support to institutions. Among other things, support to institutions would include the development of guidelines and assessment models to ensure trustworthy AI, the validation of use cases, the assessment of data quality and availability, the provision of support for data preparation, and the performance of analyses. In today's environment, it is unlikely that such competences could emerge in all institutions. Activities planned: - Development of the concept of the cyber defence centre and agreement on the role allocation	MEAC / MJ	- 2022 II half (target 2023 II half launch)	Emerges from the concept
1.8 Development and provision of common infrastructure based on the national cloud	The aim is to start developing a common infrastructure on the basis of the national cloud, so that the necessary computing resources and infrastructure are available for the development of AI, thus avoiding duplication of investments.	MEAC / ICT Centre / MER	- September 2023 - Development and provision according to the roadmap	EUR 400,000

	Activities planned: - Roadmapping			
1.9 Ordering and making available of machine-learning and linguistic-based AI groups, binaries, and microservices	The purpose of ordering and managing the AI groups, binaries, and microservices is to simplify the implementation of the AI and avoid duplicate developments. This will make it easier for public and private stakeholders, as well as citizens, to implement and develop the AI according to their needs. Activities planned: - Roadmapping - Roadmap for launching development projects in partnership with public authorities and the private sector	MEAC / ISA / ICT Centre / Institute of the Estonian Language (IEL) / MER	- February 2022 - According to the roadmap	To be specified according to the roadmap

Supporting work				
Activity	Result	Responsible authority	Term	Budget
1.10 Improvement of the data science competence and capacity of institutions	In order to better plan the follow-up activities and set targets, it is necessary to assess the data science competence and capacity of institutions.	MEAC	- 2022 II half (target 2023 I half carry out)	Emerges from the concept

	Activities planned:			
	- Development of an analysis to assess institutions' data science competence, capacity, structure, and ways to improve it			
	- Development of a maturity model for data science			
1.11 Provision of ongoing support for the launch, implementation, and management of the AI projects	The aim is to support institutions in the planning of the AI projects and validation of ideas, and to provide technical support. The result is accelerated project development and better preparation. Activities planned: - Organisation of brainstorming - Mapping of business processes and opportunities - Provision of advice and support for project planning and procurement preparation - Organisation of in-depth workshops - Organisation of hackathons and innovation contests - In-depth AI workshops to help institutions map use cases and provide an initial assessment of data quality, with suggestions for improvements - Bringing the parties together - Mentoring programme	MEAC / SA	31/12/2023 - Ongoing activity	EUR 300,000

	- Advice on financing - Organisation of the impact assessments of the projects, such as how it contributes to the number of lives saved			
1.12 Development and provision of the 'data protection sandbox' framework	The aim of the 'data protection sandbox' framework is to facilitate the introduction of the AI in the public sector (taking into account copyrights, data protection, and other requirements) by enabling the testing of solutions and providing support, thereby accelerating the development of projects. Activities planned: - Development and provision of the concept - Coordination of the activities of the 'data protection sandbox'	MEAC / MJ / DPI	- February 2022 - Ongoing activity	---
1.13 Development of requirements and measures to support the development and use of human-centred and reliable AI solutions	In order to maintain and increase society's confidence in the use of the AI and to mitigate the potential risks associated with their use, policies should be developed and appropriate requirements and measures implemented. For example, as one concrete relevant measure for transparent data processing, a requirement to implement a data	MEAC / MJ / DPI	2022 II half	---

	monitor could be introduced. Activities planned: - Analysis of legal, organisational, and technical options to ensure transparent and reliable data processing - Improvement of the legal framework and establishment of requirements to ensure transparent and reliable data processing - Development of a fundamental rights impact assessment model and guidance materials for assessing and mitigating risks to fundamental rights in the development and use of the AI - Development of a new data protection impact assessment model and guidance materials and their introduction in public sector institutions			
1.14 Raising of institutional awareness of the development and use of human-centred and reliable AI applications	In order to ensure human-centred and trustworthy AI applications, there is a need to raise awareness of the principles and requirements of human-centred and trustworthy AI, including the potential risks to fundamental rights that may be associated with the	MJ	2023 I half	Emerges from the concept

	development and deployment of the AI and possible mitigation measures. Activities planned: - Organisation of training for institutions			
1.15 Ensuring flexible and adequate funding opportunities for the implementation and uptake of data science projects	To ensure that funding measures provide flexible and adequate funding opportunities for the implementation and introduction of data science projects. Activities planned: - Preparation and development of funding measures in the context of the new SF planning	MEAC	2022 II half	To be determined on the basis of EU structural funds and national applications for the 2021+ period

Private sector

Overview:

The Estonian Research and Development, Innovation and Entrepreneurship Strategy 2035 (R&D&I 2035) establishes as one of its objectives to increase the R&D and innovation capacity of enterprises. Among other things, rapid changes in technology, digitisation, and the development of AI are increasing the need for research, development, and innovation (R&D&I) and opening up new opportunities for entrepreneurship. Artificial intelligence (AI) and robotics technologies allow companies to streamline in-house processes and supply chain operations, increase the added value of products and services, and ultimately improve their overall competitiveness. One of the focus areas of R&D&I involves digital solutions in every area of life.

While in the period 2019–2021, there were no specific activities in the private sector in the field of AI at the MEAC, with the exception of grants and services for digitalisation and robotisation, and the preparation of the AIRE centre, then, taking into account the needs and challenges identified in the R&D&I, in the coming years, private sector-driven activities on data and AI solutions will focus on raising awareness, developing skills, improving competences, and developing AI solutions. AIRE, the centre for robotics and artificial Intelligence, will create an ecosystem and develop an international network in order to support industry in the development and deployment of AI and robotics solutions. Awareness-raising activities in the private sector are planned in 2022, primarily through AIRE. In 2022, the MEAC and the joint agency of Enterprise Estonia (EE) and KredEx will develop a new policy intervention with the SF measures.

Tehnopol Science and Business Park (which is also a member of the consortium) will design development marathons and an accelerator based on its experience, and will support large-scale pilot projects based on business needs. In 2022, the Economic Development Department of the MEAC plans to map the needs and challenges of companies in the use of AI solutions even more precisely, and to analyse the best practices of other countries and the possibilities of adapting them to Estonian conditions.

In addition to AI-specific activities, a joint EE/KredEx agency has launched or is planning to launch support measures and activities for which AI-focused projects can apply/participate in, such as: applied research programme, support for product development, innovation and development shares, business development programme, digitisation grants and activities.

Strategic objectives:

The key performance indicators for the private sector are (the target levels for the indicators as at 31 December 2023 are):

1. Number of companies participating in digital maturity assessments (number of assessments, AIRE EDIH network assesses once a year, partly recurrent): 180
2. Assessment of the feasibility of AI and robotics solutions in enterprises: 150
3. Number of demo projects carried out in AI and robotics: 27 demo projects
4. Number of AIRE EDIH network companies' employees who have participated in training: 450
5. Supporting the development of AI-based pilot projects: 6–8 pilot projects
6. Number of teams that have completed the AI accelerator programme: 10

Private sector based activities

To develop a comprehensive policy intervention to support greater use of AI in the private sector				
Activity	Result	Responsible authority	Term	Budget
Mapping: business needs and challenges in developing and deploying AI solutions.	The MEAC has an overview of the challenges, and the policy instruments to address them are either in place or in the planning stage.	MEAC	Q4 2022	---
Mapping: best policy practices from other countries	The MEAC has an overview of best practices in other countries.	MEAC	Q4 2022	---

To establish a national centre for artificial intelligence and robotics				
Activity	Result	Responsible authority	Term	Budget
Preparatory activities of the Estonian EDIH AIRE consortium:				
Development and provision of the service to assess the digital maturity of businesses	Businesses have an overview of their level of digital maturity and have mapped out their capacity to implement robotics and AI solutions in the near future (3-year perspective). As at 31 March 2022, at total of 50 companies have been mapped.	Estonian EDIH AIRE (in progress)	Q1 2022	EUR 499,450

Provision of AI and robotics training for businesses	Industrial companies have become more aware of the use of AI and robotics solutions and the funding opportunities. A total of five training sessions will be carried out, the first two of which will focus on analysing the feasibility of robotics at enterprise level (including robot selection, data validation and the role of AI in robotics, ROI calculation). Three training sessions are planned for 2022 with a focus on showcasing good examples of AI in industry.			
Provision of one-to-one consultancy to industrial companies to kick-start digitisation and development projects in the fields of AI and robotics	AIRE has mapped industrial companies to participate in AI and robotics (test before invest) experiments. Business awareness has increased. A total of 25 companies will receive initial expert consultation on the potential of their business strategy to develop and implement AI solutions (initial assessment 16 hours per company).			
Advising companies on access to finance for the AI and robotics development projects	The awareness of companies of national and European-level measures has increased. Based on AIRE experts, a roadmap 2022–2023 will be prepared with a focus on funding for AI and robotics innovation (structural funds, EC grants).			

Preparation and launching of AI and robotics experiments / demo projects	Six AIRE demonstration projects have been launched to test innovative solutions in industry and hospitals (horizontal piloting sector: healthcare).			
Organisation of AIRE clubs	Five AIRE clubs are organised to develop the network (funders, researchers, experts, industry, robot importers, telecom companies, etc.).			
EDIH application preparation	Preparation of the final EDIH application by 22 February 2022.			
If Estonia's EDIH application receives a positive funding decision, AIRE will continue with the activities listed above from 2022–2028.				Budget EUR 1 million per year from the European Commission, EUR 400,000 from the Estonian State (MEAC), and EUR 600,000 co-financing from the consortium.

To support AI-based developments and pilot projects				
Activity	Result	Responsible authority	Term	Budget
AI development programme activities:				
Organisation of development marathons (bootcamps)	AI solution providers and users have developed pilot project ideas in intensive development marathons (up to 100 participants create up to 20 joint projects)	Tehnopol Science and Business Park	Q1 2023	About EUR 170,000
Organisation of accelerator programme (training modules: product development and prototyping, business development, information security and data protection, customer case validation, team building, investor readiness).	Companies have participated in a six-month AI technology accelerator programme (up to 10 companies)			
Validation of AI-based pilot projects	The feasibility, commercial potential, and return on investment of AI solutions are assessed			

	(AIRE methodology) (up to 20 validation reports)			
Support for the development of AI-based pilot projects (grant estimated at EUR 40,000–50,000 per project + consultancy)	Companies have developed projects using AI solutions (6–8 pilot projects)	Tehnopol Science and Business Park	Q1 2023	EUR 380,000
Funding AI solutions in horizontal (i.e. non-sector specific) support measures. Under a number of support measures, companies can apply for support for the development of, among other things, AI-based solutions.				
To support automation and the introduction of digital technologies and robots in companies (in the fields of manufacturing, mining, and logistics). AI is being used more widely.	Companies are investing in automation and digitalisation, or the introduction of robots, with the aim of reducing the need for human intervention and increasing supply chain efficiency by optimising processes and using and managing data efficiently.	MEAC, promoter EE	2022–2025	EUR 56 million
To support companies to carry out applied research and experimental development (grant for the applied research programme twice per year	Increase in the volume of product development	MEAC, promoter EE	2021–2027	EUR 16.48 million +

+ continuous upstream consultancy) https://www.eas.ee/teenus/rakendusuuringuteprogramm/	following R&D, increase in the sales revenue generated by companies from new or significantly modified technologies, products or services			budgetary funds according to possibilities
Provision of innovation and development shares to businesses (current call for applications) The innovation share makes it possible to develop innovative solutions to development challenges, test new materials, gather knowledge on technological feasibility, carry out research in the intellectual property databases. https://www.eas.ee/teenus/innovatsiooniosak/ The development share also allows for the additional costs of carrying out a feasibility study, hiring an R&D person, and acquiring materials. https://www.eas.ee/teenus/arendusosak/	Increased cooperation between small or medium-sized enterprises and knowledge service providers through small-scale innovation projects.	MEAC, promoter EE	2021–2027	EUR 8.24 million
To support business research and development and innovation (R&D&I) related awareness and capacity The expert support service for R&D cooperation enables the identification of companies' development, testing, analysis or certification needs, the identification of suitable service providers and	The use of services developed by EE has increased the awareness and capacity of companies to increase technology and knowledge-based R&D&I	MEAC, promoter EE	2021–2027	EUR 19.84 million

cooperation partners among RTOs and innovation service providers, negotiation advice, etc. Permanently open from 2019. Link. Technology intelligence aims at the early identification of technological risks and opportunities in a company's competitive technological environment. Searching for suitable technologies for companies, analysing competitor and sector development portfolios, technology foresight, identifying freedom to operate and novelty. Permanently open from 1 December 2021. Link. Intellectual property consultation. Development and implementation of the company's intellectual property (IP) strategy, development and implementation of protection strategies for specific products and IP objects, IP (development/collaboration) contracts, etc. Link.	activities and improve business performance			

R&D and education

Overview:

In the period 2019–2021, seven research areas were supported through the IT Academy's research action in cooperation between the state, entrepreneurship, and the academy, of which about half, amounting to EUR 4.5 million, were related to AI, data science, and automation. The IT Academy also supported the development of non-ICT electives in AI, with around half of the curriculum development projects related to AI. The NUTIKAS measure allocated more than EUR 6 million for 25 applied research projects carried out in partnership between businesses and research institutions. From the perspective of infrastructure, Estonia's accession to the EuroHPC Joint Undertaking and the LUMI consortium is an important development, as a result of which Estonian research institutions and companies have access to world-class supercomputing resources from 2022.

In the new period, there will be a greater emphasis on competence and skills. The Education Strategy 2035 sets as one of its strategic objectives to match learning opportunities to the evolving needs of society and the labour market. Information and communication technology (ICT), which is represented as a priority area in the Estonian Research and Development, Innovation and Entrepreneurship Strategy (R&D&I 2035) in the form of the focus area 'Digital solutions in all areas of life', is an area in need of priority development in society, which is integrated into general, vocational, and higher education through various measures. AI has an important role to play in today's ICT environment, and one question is where the state needs to intervene and ensure that AI-related issues are addressed separately, and where self-regulation is sufficient.

R&D activities in the field of ICT, which fall outside the main instruments for research funding, are mainly targeted and funded through the IT Academy research measure. The role of R&D, both now and in the future, is to take our knowledge in these areas further so that Estonia's higher education, research, business, and wider society reap the maximum benefits. In the case of small languages, it is also important to

develop the possibilities of language technology to the next level, as one of the guarantees of the existence of a small culture is whether we can communicate in Estonian with our devices and various services. The role of scientific infrastructure, in this case high-performance computing (HPC), is to provide the technical capacity and skills to develop AI.

Strategic objectives:

The activities in the field of education are mostly in the planning phase and the corresponding metric will be specified during or by the end of the period, so the main metric to look at initially would be the volume of R&D activities in the field of AI, which at the time of the adoption of the strategy is estimated at EUR 1.5 million per year, with the aim that this level will not decrease.

R&D and education based activities

Development of awareness, competence, and skills				
Activity	Result	Responsible authority	Term	Budget
Objective: To promote interest at different levels of education in the possibilities and tools of IT, including AI. To integrate general knowledge on AI into horizontal measures, in particular in-service training and general education, and go deeper into higher education.				
3.1 Development of skills to support businesses in the digital transition	On the in-service training side, it is important to raise the skills of different levels of entrepreneurship (specialists, managers), which is a prerequisite for a successful digital transition. To this end, training and re-training programmes will be set up, horizontally integrating an awareness of the potential of AI – AI is increasingly all around us, and	MER	2022–2023	The total volume of the measure, of which the AI part is

				not identifiable, is EUR 10 million.
	it is therefore important that staff at different levels are able to understand its potential role and set realistic expectations. • ICT in-service training and re-training modules will be launched in at least five areas • At least 2,000 people participate in training and re-training programmes			
3.2 Raising interest in IT among young people	ProgeTiiger supports the development of IT electives and teaching materials, in-service training of IT teachers and popularisation from primary to secondary school. The broader aim is to generate early interest in IT in general, but AI as a topic can be integrated into the curriculum development, together with possibilities and examples (see clause 3.1 on horizontal AI integration for comparison).	MER, HARNO	2022–2023	The total volume of the measure, of which the AI part is not identifiable, is EUR 11.4 million for the period 2022–2029
3.3 Integration of AI skills into IT vocational education and training curricula	In IT vocational education and training, there are curricula (e.g. software developer) where it is important in today's IT job market to be aware of the possibilities offered by AI and to have the skills to use these tools in the development process. It is therefore important to integrate AI into the curricula supported by the IT Academy's VET programme.	MER, HARNO	2022–2023	
3.4 Increasing of the number of IT professionals and	The measure for sustainable ICT higher education will support the next generation of ICT workers and ensure high-quality professionals for	MER, MEAC, HARNO	2022–2023	

researchers through higher education	employers. The content of the measure is currently under development and in the working version the objectives are horizontal, including: • 80 IT PhD students per year • To increase IT doctoral admissions to 100 PhD students per year The field of AI is an organic part of IT higher education and is therefore represented, but taking into account the focus area I of the R&D&I strategy 'Digital solutions in all areas of life' and the fields of ICT research measure, clearer vertical foci can be identified to focus on (e.g. AI, data science).			
3.5 Supporting the development of electives on AI in non-ICT postgraduate studies	Supporting the development of AI subjects under the IT Academy's development projects funding measure. The AI component gives the project an extra weight in the assessment.	MER, HARNO	2022–2023	Based on the results of the call for applications

R&D				
Objective: To support critical R&D for the development of AI and develop access to the high-performance computing power needed to create AI solutions.				
3.6 Reflection of AI in the roadmap of the R&D&I strategy's focus area I 'Digital solutions for all areas of life'.	AI topics are represented in the roadmap of the R&D&I focus area I. This, in turn, will provide strategic direction to, among others, the IT Academy and its ICT research measure.	MEAC and MER	2022	-
3.7 Supporting R&D in AI	The ICT research measure of the IT Academy currently supports three related research areas: AI and machine learning; data science and big data; and robot-human collaboration. The future may also hold that AI will be present among the priorities of the focus area I of the R&D&I strategy 'Digital solutions in all areas of life', and thus the thematic R&D programme will need to support relevant R&D activities.	MER, MEAC, HARNO	2022–2023	From 2022–2023, the ICT research measure will have a capacity of EUR 3 million per year for projects related to AI
3.8 Development of Estonian language technology and language resources	The aim is to ensure the development, high quality, and introduction of the key components of the Estonian language, and thereby ensure the sustainability of the	MEAC / MER / IEL / ISA	2022–2023	EUR 3.57 million

	Estonian language and improved accessibility of services. Activities planned: - Implementation of the Estonian Language Technology Strategy 2022–2024 - Supporting, through the activities of the 2017–2027 Estonian Language Technology Strategy, the R&D activities (ICT levels ~1–3) and language corpus that are the basis and prerequisites for next-level applications of AI. - To ensure funding for the development, implementation, and support of language technologies across administrative sectors in the new SF period - To establish a centre of excellence, based on the IEL and the ISA, for the development of transnational language technology solutions and secure core funding			
3.9 High-quality access to high-performance computing (HPC) capacities for Estonian	The development of AI is computationally extremely intensive. On the research infrastructure side, the objectives of the strategy are supported by Estonia's participation in the EuroHPC Joint Undertaking and the Finnish CSC-coordinated LUMI pre-exascale	MER, Estonian Scientific Computing Infrastructure (ETAIS)	2022–2023	EUR 660,000 (2021–2026, in total EUR 2 million)

research institutions and businesses	supercomputing consortium. The LUMI resources will be available to Estonian research institutions and companies from 2022.			

Data as enabler

Overview:

The lack and insufficient quality of the data are major obstacles to the launch and development of the AI project. Data therefore plays an important role in the development of the AI. For projects to succeed, it is necessary to ensure that data is available in a machine-readable format. When the drafting of Estonia's National Artificial Intelligence Strategy was launched in 2018, open data had been made public few times and the maturity of the field was low. Today, more than 100 institutions have made open data public, and open data is increasingly being used in the development of the AI. In order to support the development of the AI and to support the sustainable development of Estonian language technology, further measures are needed to develop data management and to increase the disclosure of open data.

Strategic objectives:

Building on the current state of play, the aim is to support institutions to increasingly disclose open data, to improve data discoverability and use, and to ensure data quality. In line with the approach provided in the strategy, the aim is to measure its implementation by the following key performance indicator (the target levels for the indicators as at 31 December 2023 are):

1. Number of open data disclosed in the portal: 1800, baseline 709

'Data as enabler' based activities

Enablers for development leap				
Activity	Result	Responsible authority	Term	Budget
4.1 Development of data management	Today, major obstacles to the successful implementation of the AI projects are data availability and quality. There is a need to systematically engage in data management and to provide support to the institutions. Activities planned: - Implementation of the data management strategy - Training of data stewards - Development and deployment of the data management tool RIHAKE - Development of RIHA, including analysis of data-driven reporting needs - Modification of the legal framework	Statistics Estonia / MEAC / ISA	Ongoing activity	EUR 3 million
4.2 Promotion of access to open data	Increasingly, open data is being used in the development of AI. Open data is also important for the development of Estonian language technology. However, data availability remains a problem today. To this end, it is necessary to systematically promote the availability and usability of open	MEAC / ISA	Ongoing activity	EUR 800,000

	data.			
	Activities planned:			
	- Implementation of the open data activity plan			
	- Development and management of the open data portal			
	- Provision of support to public authorities in disclosing open data			
	- Improvement of the capacity to retrieve machine-readable data from national registers			
	- Conducting of an impact assessment on open data			
4.3 Establishment of 'high-value' datasets to support the development of the AI	On the one hand, to further improve the availability of essential data, there are plans to establish six categories of 'high-value' datasets in the European Union. On the other hand, Estonia has been at the forefront in this field and plans to introduce additional categories of 'high-value' datasets to support the development of AI. For example, the list of language datasets out those language datasets the use of which contributes to the sustainability of the Estonian language and supports the development of language technologies and improves, among other things, the quality of language technology applications. Activities planned:	MEAC / MER / Institute of the Estonian Language / MJ	- 2022 I half - 2022 I half - Based on the analysis	To be specified according to the requirements

	- Establishment of language datasets as 'high-value' datasets - Conducting of analysis to map 'high-value' datasets - Imposing of additional requirements based on analysis			

Legal framework

Overview:

In the area of shaping the legal framework, the 2019–2021 AI Strategy aimed to develop a package of the 'AI laws' to enable the deployment of AI. As part of this, an intention to develop a regulation on the effects of algorithmic systems (the so-called 'AI VTK') was drafted with the aim of identifying possible changes to existing law to accommodate the introduction of AI. As the European Commission presented an initiative in April 2021 for an EU-wide regulation on artificial intelligence (AI), the legislative activity has been redirected towards solving specific problems that need to be regulated and can be regulated independently of EU action. In particular, this has meant drafting an amendment to the Administrative Procedure Act, which introduces the conditions for the issuance of automatic administrative acts and provides for additional formal requirements for the processing of personal data in administrative proceedings.

Strategic objectives:

During the period covered by this strategy, the procedure for amending the Administrative Procedure Act is planned to be finalised. Alongside this, the main legislative activity is active participation in the drafting of legislation and instruments of the European Union and the Council of Europe regulating AI, in order to protect Estonia's interests in the development of a pan-European legal framework. The focus of these initiatives is to regulate the development and use of AI in a human-centred and trustworthy way, i.e. in a reliable, ethical, and lawful way that respects fundamental rights, as well as to establish a set of rules on civil liability related to AI.

Activities based on the legal framework

Activity	Result	Responsible authority	Term	Budget
5.1 Development of the draft Act amending the Administrative Procedure Act	A general basis for automatic administrative acts is established. It also introduces additional formal requirements to make the processing of personal data in administrative procedures more transparent.	MJ	Submission to the Government of the Republic: Q1 2022	---
5.2 Participation in the negotiation of the Regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and advocacy of Estonia's views	The Artificial Intelligence Act takes into account Estonia's views to the maximum extent possible. There is a need to avoid proactive over-regulation in a rapidly evolving area. The regulation to be put in place should also aim at enabling the introduction of AI and should not create unnecessary obstacles.	MEAC / MJ	Ongoing involvement in the EU regulation process in 2021 and the following years	---
5.3 Participation in the development of civil liability rules for AI and the digital era in the EU, including participation in the public consultation and participation in the negotiation of a future EU	Estonia has presented its views on the civil liability of AI in a public consultation. The future EU draft legislation will take into account Estonia's views to the maximum extent possible.	MJ	EU public consultation: 10/01/2022 Future EU legislation: subject to the outcome of the public consultation	---

legislative initiative and advocacy of Estonia's views			and the presentation of a future EU legislative proposal	
5.4 Participation in the negotiations of the Convention on Artificial Intelligence of the Council of Europe and advocacy of Estonia's views	The Convention takes into account Estonia's views to the maximum extent possible.	MJ	Estimated 2022–2023	---
5.5 Participation in policy and legislative development in the field of AI at the EU and other international levels.	It is important to be involved in shaping policy and legislation at the EU and other international levels to promote Estonia's interests and ensure the feasibility of AI and its compliance with the principles of a human-centred digital state and the requirements of trustworthy AI. Activities planned: - Based on international initiatives	MEAC / MJ / MFA	Ongoing activity	---