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National Audit Office of Estonia

Overview of the development of AI solutions in public sector organisations

National Audit Office of Estonia Overview on the International Joint Audit of Artificial Intelligence

Overview by the National Audit Office
Estonia to the Riigikogu
Tallinn, 30 May 2025

Summary

Developments in the field of artificial intelligence in recent years have created significant new opportunities. Many Estonian public sector organisations have started to develop, test and use innovative AI-based solutions. The introduction of such solutions should help organisations to better fulfil their tasks, including provide better quality services, make faster decisions, reduce costs.

A joint audit is on course for completion in early 2026 in cooperation with the twelve supreme audit institutions of EUROSAI, the objective of which is to assess the readiness of the government sector to adopt AI solutions. The National Audit Office participated in the joint audit and prepared an overview to provide a picture of how Estonian public sector organisations are developing and using AI solutions and what the main obstacles are in this area.

According to the list of AI based solutions compiled by the Ministry of Justice and Digital Affairs, 130 solutions have been developed in the public sector, but this list does not give an overview of developments in recent years, and experts believe that many of them are not AI solutions. Approximately 30 AI-based solutions have been created in the organisations that responded to the survey of the National Audit Office. Most of these solutions are still being tested and do not offer significant cost savings, better quality public services or faster decision-making.

The main obstacles to the creation and introduction of AI solutions are:

- **The development of AI solutions is hampered by a lack of awareness among employees of the options offered by AI and its areas of application.** On the one hand, the development capacity is limited by the lack of specific technical expertise, for example, the lack of a smart customer from an AI perspective, whose involvement is necessary to develop solutions. Nor do ideas or proposals for new solutions emerge in organisations where the majority of staff have no knowledge of the potential of using AI in their field.
- **The creation of AI solutions is hindered by the poor quality of databases.** The survey carried out in the course of the overview showed that a considerable number of organisations see data quality as an important issue and are working to improve it. At the same time, the survey revealed that as many as one-third of

organisations are not actively engaged in improving data quality, which in turn makes it difficult to develop and implement AI solutions.

- **The creation of AI solutions is hindered by the inability to cope with regulatory restrictions.** Difficulties mainly arise from data protection rules that limit the use of personalised data both in the training and implementation of AI solutions.

In order to create a better environment for the development of AI solutions, the Ministry of Justice and Digital Affairs, which is leading the area, should pay more attention to removing the obstacles to the development of solutions. At the national level, it is necessary to support public authorities in making the right choices in the legal environment, by developing guidance, carrying out training, giving advice, etc. for this.

Organisations themselves must invest significantly more in improving data quality and increasing knowledge to successfully implement AI solutions. In the future, as solutions are developed and data volumes increase, appropriate IT infrastructure solutions (i.e. hardware and software environments supporting computing and software development) must be found to maximise the performance and security of AI solutions.
In addition, organisations must assess whether their planned AI solution is economically reasonable, i.e. whether it will help save costs, improve the quality of public services or enable to make faster decisions.

Contents

What is artificial intelligence (AI) and an artificial intelligence solution?

Artificial intelligence system – a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments.

Source: European Union Artificial Intelligence Act

1. Artificial intelligence is an area of theory and development of computer systems that aims to create systems capable of performing tasks that traditionally require human intelligence. An AI solution is based on a software algorithm that is autonomous and capable of learning, and performs tasks traditionally performed by humans.

2. The application of AI in public sector organisations allows them to make policies more efficiently, deliver better services, make faster and better decisions and free officials from routine tasks. Given the steady increase in the costs of public sector organisations, it is important to invest in innovative solutions that help make work more efficient and save resources.

3. Systems that process large amounts of information, but are not AI solutions, are often erroneously presented as AI solutions. A key feature of AI solutions is their learning capacity. If a system can analyse the data and improve its performance on the basis of them, it can be considered a self-learning system. However, if a system has fixed inputs and outputs, without the ability to adapt the way it works, it is an automating process, not artificial intelligence.

AI – a practical application based on AI technologies, which is based on a software algorithm that is autonomous, capable of learning and performs tasks traditionally performed by humans.

Source: kratid.ee

4. In Estonia, several public sector organisations have started developing AI-based solutions on the initiative of the Ministry leading this area (the Ministry of Economic Affairs and Communications until December 2024 and the Ministry of Justice and Digital Affairs from January 2025). In Estonia, a solution like this is also called *kratt*[1], a name inspired by folklore.

Generative AI – AI that can generate original content (e.g. text, images, video, sound or software code) in response to a user's input or query.

Source: www.ibm.com

5. According to the information of the Ministry of Justice and Digital Affairs, the narrow AI is mostly used in AI applications. Narrow AI is able to solve one narrow task and learn from its experience to solve the problem more successfully, but cannot learn in the course of the activity what, for example, the next tasks and problems might be.[2] In addition to narrow AI, generative AI, which can create entirely new content – text, images or sound – is also becoming increasingly common around the world (see Table 1).

[1] Kratid.ee.

[2] https://akit.cyber.ee.

Table 1. Ways to categorise AI

Capacity	Functionality	Technology
Narrow AI	Reactive machines	Machine learning
	Limited Memory	Deep Learning
Generative AI	Theory of Mind	Natural Language Processing
		Robotics
Superintelligent AI	Self-aware AI	Computer Vision
		Expert Systems

Source: National Audit Office, Understanding the different types of artificial intelligence

6. Although the description of an AI solution in the AI strategy meets the main conditions of AI, several specialists interviewed in the audit questioned the AI skills of several of the AI solutions listed in the kratid.ee list, i.e. mainly the absence of the ability of an artificial intelligence solution to learn. From the point of view of the organisation itself, such a solution may also be appropriate and simplify work processes, but it is not an AI solution.

7. The National Audit Office (NAO) wanted to get an overview of the development and use of AI solutions in public sector organisations: how many such solutions are in use and what are the main obstacles to their creation. For this purpose, the National Audit Office conducted a survey among ministries and other major organisations. The National Audit Office sent the questionnaire to 58 organisations and 48 organisations responded (see Table 4 for the characterisation of the overview). The results of the survey are presented in the following chapters and the conclusions drawn from them.

How many AI solutions have been created?

8. There is currently no up-to-date and comprehensive overview of the state of development and use of AI solutions. The overview is necessary to allow organisations to share experiences and avoid developing duplicate solutions.

9. According to the list of AI solutions compiled by the Ministry of Justice and Digital Affairs (kratid.ee), more than 130 solutions have been created in the Estonian public sector or in cooperation with the public sector for different purposes (see Figure 1), ranging from one-off ready-made solutions to solutions that are still in active use or in progress. According to this list, a total of 53 public sector organisations

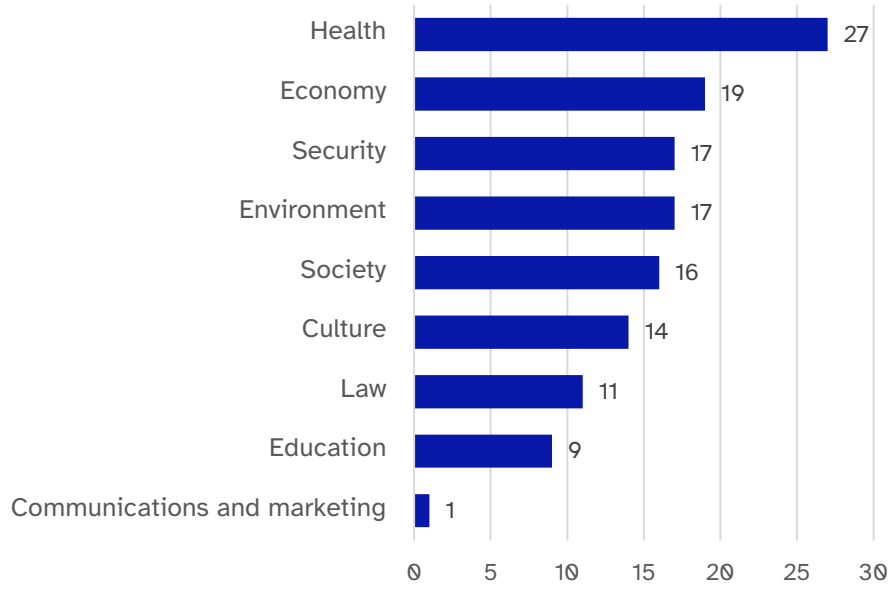
20 responding organisations that have developed AI solutions:

- Ministry of Education and Research
- Ministry of Defence
- Ministry of Economic Affairs and Communications
- Ministry of Finance
- Ministry of the Interior
- Ministry of Foreign Affairs
- Land Board
- Tax and Customs Board
- Agricultural Registers and Information Board
- Rescue Board
- Estonian Information System Authority
- Transport Administration
- Environment Agency
- Information Technology Centre of the Ministry of Environment
- Government Office
- Office of the Riigikogu
- IT and Development Centre of the Ministry of the Interior
- National Archives
- Estonian Unemployment Insurance Fund
- Estonian Public Broadcasting

The public sector organisations that took part in the survey have developed around 30 AI solutions that are actively used

(35 of which are public authorities) have created projects with an AI component to improve their work.[3]

Figure 1. AI solutions described according to areas on the kratid.ee website



Source: kratid.ee

10. The data of list of AI solutions of the Ministry of Justice and Digital Affairs had not been updated for two to three years at the time of the audit, and therefore there is no overview of developments in recent years. Updating the list of AI solutions regularly is necessary to share information on AI solutions already developed, to exchange know-how on AI development and to avoid the development of duplicate solutions. The list also includes solutions that have now been removed from use. At the time of preparation of the overview, the Ministry of Economic Affairs and Communications, and later the Ministry of Justice and Digital Affairs, were in the process of updating the list of AI solutions.

11. According to the survey of the National Audit Office, 20 out of 48 organisations that responded to the survey have created AI-based solutions. However, the total number of actively used solutions is less than 30. Examples of the most common solutions include machine learning-based prediction models, decision support and speech or image recognition solutions.

AI solutions developed so far

Examples of AI solutions developed by the state

12. The solutions of organisations and the departments vary considerably due to needs. There are more generic solutions (e.g. for transcribing text), more specific solutions (e.g. supporting software development), or forecasting and prediction models (e.g. the Tax and

[3] https://www.kratid.ee/kasutuslood-kratid

Customs Board has several models supporting the detection of labour tax and VAT refund fraud) in use.

13. The survey of the National Audit Office revealed that the most common solutions are machine learning solutions, including image and facial recognition. Speech recognition, text search and transcription solutions have been added to this in a couple of organisations. AI solutions are also used in software development and text analysis (see Table 2).

Table 2. Examples of the AI solutions of the observed organisations

Text, image or speech recognition	Prediction models	Chatbots
Surface monitoring – detection of field mowing from satellite data (Agricultural Registers and Information Board).	A data mining model for detecting VAT refund fraud (Tax and Customs Board).	Bürokratt (developed by the Estonian Information System Authority, users – Consumer Protection and Technical Surveillance Authority, Tax and Customs Board, Police and Border Guard Board, etc.).
HANS – speech recognition and transcription (Riigikogu). Transcription solutions (Estonian Public Broadcasting), including live subtitles and publicly available transcripts of archived broadcasts.	A model for detecting labour tax fraud, combined with existing rule-based systems (Tax and Customs Board).	Vesta chatbot (previously used by the National Library of Estonia).
Species identification software (Environment Agency (KAUR), Information Technology Centre of the Ministry of Environment (KEMIT)) – the system calculates the abundance of species in a given area using images collected by trail cameras. The images are classified by artificial intelligence and the abundance of species is then determined using a random encounter model based on calculations. Snow cover determination solution (KAUR, KEMIT) – determination of snow cover during weather monitoring.	Decision support OTT (Estonian Unemployment Insurance Fund) – summarises a specific client's situation, predicting the likelihood of finding work in six months, the likelihood of becoming unemployed again and the factors that have the greatest impact.	
Marta – automatic tagging of articles (National Library of Estonia).		
Classification of customs x-ray images to detect contraband (Tax and Customs Board).		

Source: Survey by the National Audit Office

Bürokratt is a chatbot that an organisation can integrate, e.g. in the organisation's website or application, to make its work easier.

Source: bürokratt.ee

14. The survey revealed that the most common tool used by organisations is Bürokratt, developed by the Estonian Information System Authority (RIA). Bürokratt is an AI-based communication channel between an organisation and a client. The success of Bürokratt, i.e. the quality of the answers it gives, depends to a large extent on the contribution of the organisations themselves in training it. More than six

The most widely used AI solution is Bürokratt

Reusable AI component – the base component of an AI-based solution, which can be reused free of charge and further developed according to the needs of all public and private stakeholders.

Source: White Paper on Data and Artificial Intelligence 2024–2030

GitHub – a web hosting service for IT projects with jointly developed version management.

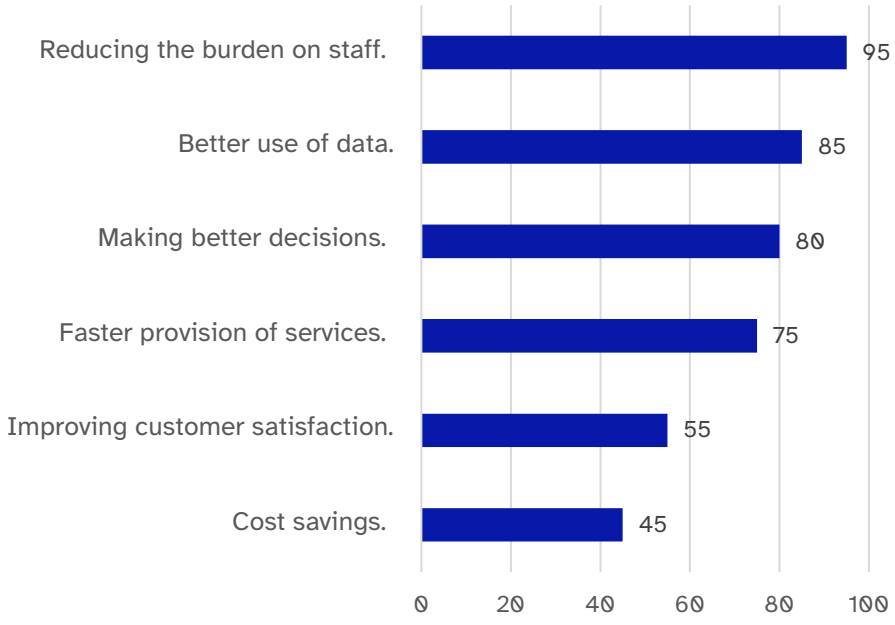
Source: Data Protection and Information Security Portal AKIT (https://akit.cyber.ee/)

million euros has been spent on the development of Bürokratt so far and at the moment, it is used in ten public sector organisations.

15. Reusable AI components, which can be reused free of charge and further developed according to their needs by all public and private stakeholders have been created in addition to full AI solutions. These components are available in the e-Government Code Repository and on GitHub. Examples of solutions available as reusable AI components include the anonymiser (developed by the RIA), neurotranslation, neurospeech (both developed by the University of Tartu), the Texta Toolkit (Texta) and the quick writer (TalTech).

16. The organisations that took part in the survey find that the biggest benefits of AI solutions include reducing the staff workload, making better use of data and making better decisions (see Figure 2).

Figure 2. Opinions of the 20 organisations that have developed AI solution of the benefits of creating these solutions (share of organisations, %)



Source: Survey by the National Audit Office

17. In parallel with the AI solutions they have created themselves, public sector organisations also use or have used solutions developed by other Estonian ministries and foreign ready-made AI solutions to make their work easier. Bürokratt is the most widely used solution developed in Estonia and the other solutions mentioned are the Riigikogu shorthand system HANS, the text-to-speech application Texta Toolkit, the public speech recognition service of the TUT Speech Technology Lab Tekstiks, etc. According to the survey of the National Audit Office, the most used foreign ready-made solutions are ChatGPT (is or has been used by 35 organisations), Copilot (17), Grammarly (9) and Gemini (6). Seven organisations noted that they do not use any foreign solutions.

18. Only some AI solutions are in active use, most solutions are still being tested and do not offer significant cost savings, better quality public services or faster decision-making. There is still much to be done to automate work processes more, to extend the scope of use and to reap greater benefits from the solutions. The intentions of organisations to develop AI should be included in their action plan or work plan.

What is the state's AI strategy like?

19. The state has an overall strategy for the development of AI and the solutions that contain it. The development of these solutions currently depends largely on external funding, with major developments being supported by EU grants. However, most of the expenditure needed to maintain the solutions has to be covered with funds from the state budget.

20. The creation of the first national AI action strategy of Estonia started in 2018 and was prepared for 2019–2021.[4] The latest AI strategy was created for 2024–2026[5]. While the main objective of the first AI strategy was to create the base capacity for the deployment of AI solutions, the actions of the current action plan are already geared towards making the state more efficient, e-services more accessible and easier to use. So far, the Ministry of Economic Affairs and Communications has not prepared any reports on the implementation of the AI strategies.

21. The focus themes of the strategies have been similar throughout, focusing on topics relevant to the creation of AI solutions, such as public and private sector activities, data, the regulatory environment and R&D. There are also objectives in the strategies for different periods that have remained the same over time, for example in the area of training public sector employees. There are also some objectives that have been postponed, such as the creation of a single infrastructure for AI solutions.

22. In addition to the AI strategy, there are a number of other strategies and agendas that guide the development and implementation of AI solutions, including the White Paper on Data and Artificial Intelligence[6], the Digital Agenda 2030[7] and the Research and Development, Innovation, and Entrepreneurship (RDIE) Strategy 2021–2035[8].

[4] Estonia's National Artificial Intelligence Strategy 2019–2021.

[5] Artificial Intelligence Strategy for 2024–2026.

[6] White Paper on Data and Artificial Intelligence 2024–2030.

[7] Estonia's Digital Agenda 2030.

[8] Estonian Research and Development, Innovation and Entrepreneurship Strategy 2021–2035.

Strategy for development of artificial intelligence of public sector organisations

Most public sector organisations are not planning activities or money for the development of AI

23. An AI strategy, either as a separate document or as part of another planning document of the organisation, is necessary to agree how AI solutions support the overall objectives of the organisation; what the priorities and resource allocation are to avoid developing unnecessary solutions; how the risks of solutions are assessed and their security ensured; how the relevant skills of employees are developed and how innovation in the respective area is supported.

24. The survey indicated that most, i.e. 37 of the organisations currently do not have a strategy or action plan for AI development, nor do they have plans or objectives for implementing and creating AI solutions. In other words – many organisations have not set specific targets, planned longer-term activities or money for the development of AI solutions.

Funding of AI solutions

The state's budget for the development of AI for the period of 2024–2026 is more than €60 million in total

25. According to the AI Strategy for 2024–2026[9], €60 million is planned for the development of AI for the years 2024–2026. In comparison, a total of €243 million has been planned for the development of the e-governance over the same period.[10] 12 million of the money earmarked for the development of AI is allocated directly for the creation of AI solutions, with the rest for activities supporting the area of AI. Supporting activities include, for example, research and development, education and ensuring competencies, language technology development, development of high-performance computing, creation of trusted AI and a regulatory environment.

26. The creation of AI solutions is currently largely funded by EU grants and to a lesser extent by state budget funds, which means that funding for long-term development in the area requires national funding. EU funds enable organisations to implement the first initiative or create an AI-based application. However, in most cases, these funds cannot be used to cover the costs of upgrading and maintaining an application, and therefore it can be difficult for organisations to find the necessary money later on. It would be important to consider the exact purpose, necessity, use and economic viability of an AI solution from the outset, so that the solution developed brings at least as many benefits to the organisation as it costs to create and maintain.

27. The problem of maintaining AI solutions is partly confirmed by the list of 130 AI solutions prepared by the Ministry of Justice and Digital Affairs, as many of the solutions on this list are no longer used or developed further by the organisations. Unless an organisation can find

[9] Artificial Intelligence Strategy for 2024–2026.
[10] Estonia's Digital Agenda 2030.

the money to keep an AI solution up and running, it will remain stagnant, lose its relevance and, over time, its usability.

What are the main obstacles to the creation of AI solutions?

The readiness to create and implement AI is low

Examples of quality data characteristics:

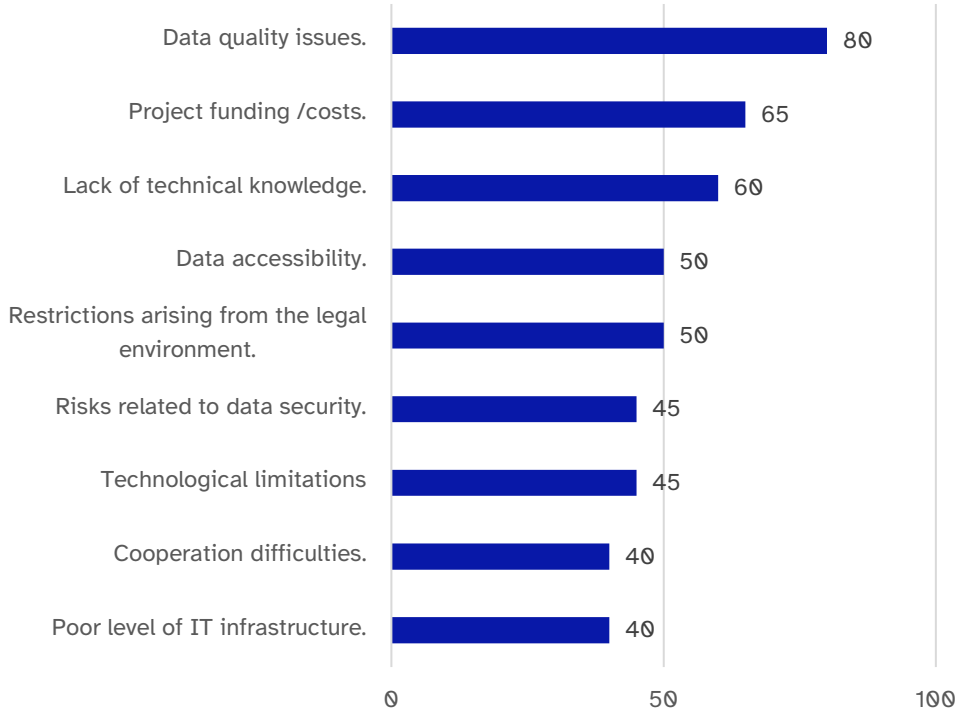
- correctness – the data are formally correct (syntactically correct) and substantively correct or authentic (semantically correct);
- completeness – all attributes of a data record have a value and all required records exist;
- timeliness – the data are fresh and their accessibility corresponds to the needs and requirements;
- regularity – the format and structure of the data meets the requirements;
- uniqueness – only one record of a single real-life object has been recorded in the data;
- in the same format throughout.

Source: Estonian Data Management Methodology Project. Data Quality Guideline. European Commission, August 2020

28. The main obstacles to the capacity of organisations to create AI solutions are poor data quality, lack of technical expertise, insufficient funding and the inability to cope with regulatory constraints.

29. Data quality was rated as satisfactory or poor by 80% of the organisations surveyed, and was considered to be the biggest obstacle to the creation of AI solutions. Organisations also cited strict data protection requirements as an obstacle, suggesting that the organisations do not know how to implement the legal requirements in terms of performance (see Figure 3).

Figure 3. Main obstacles to the creation of AI solutions (share of respondents among 20 organisations, i.e. of the organisations that have created such solutions, %)



Source: Survey by the National Audit Office

30. In addition, the surveyed organisations have highlighted reasons why AI solutions that were already planned did not make it into development: 7 organisations mentioned lack of money and competence, 2 organisations referred to data sensitivity and 2 organisations to the imprecision of the model and failed development attempts, including situations where automation is a cheaper way to achieve the desired objectives.

Quality of data

Artificial intelligence (AI) model –a mathematical algorithm or representation trained on data that can make predictions, decisions or perform actions that mimic or support human intelligence.

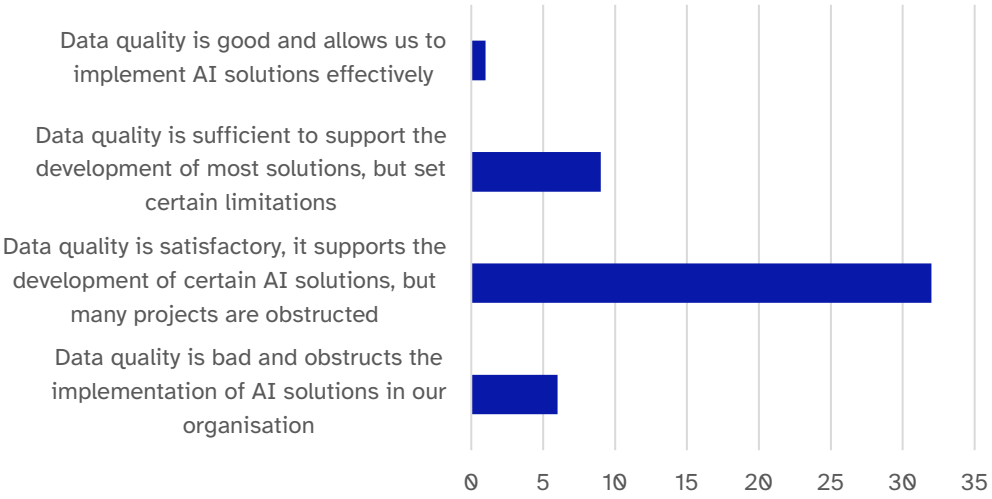
Source: National Audit Office, ISO/IEC22989

80% of public sector organisations that responded find that the quality of their organisation's databases is satisfactory or poor

31. The accessibility and quality of data are at the core of the creation of AI solutions. The capabilities of AI models will remain limited without reliable and accessible data, which in turn will reduce their practical value. Data quality has a direct impact on the quality of the solutions that can be developed on the basis of them. For example, a machine learning model built on poor quality data is less accurate and reliable. Failure to address data quality immediately could prolong the time needed to develop future data-driven solutions. In addition, the amount of data is not sufficient for training a model in some cases.

32. As a result of the survey conducted by the National Audit Office, 80% of the respondents, or 38 organisations, rated the quality of their databases as poor or satisfactory (see Figure 4). This makes it more difficult to create AI solutions in these organisations.

Figure 4. How do organisations rate the quality of their data? (the opinions of 48 organisations that responded to the survey, broken down by different responses)



Source: Survey by the National Audit Office

33. Although the organisations are mostly aware that the quality of the data is not high, no significant progress has been made in this regard. The importance of data and the potential of their use is well recognised both in the organisations and at the level of the state's AI strategy, but the results of the survey of the National Audit Office showed that a third of respondents do nothing to assess or improve data quality. Addressing data quality does not necessarily mean good data quality either. For example, only 36% of organisations have described the basic data of the organisation.[11]

[11] White Paper on Data and Artificial Intelligence 2024–2030.

34. Although the Government of the Republic established the regulation "Fundamentals of organisation of services and information management[12]" and Statistics Estonia has prepared guidelines for ensuring the quality of the data in the databases that belong to the information system, many organisations do not deal with their data and data quality preventively, but only after consequences have appeared.

35. An example of the problems caused by poor quality data and why it is important to improve their quality can be found in the area of health. In the health information system, many of the patient health data are entered in free text format, which makes machine-processing and analysis difficult. In order to analyse health data effectively, it is important to ensure that they are machine-readable – this means that there must be agreed standards, data formats and common terminology to describe the data. Entering data into the information system should be done in accordance with these agreements. Machine-readable and standardised health data are important, as they make it possible to provide better and safer care and support effective data-driven decision-making across the health care system.

36. According to the AI strategy, the Ministry of Justice and Digital Affairs has planned a number of activities to improve data quality in databases, but no significant progress has been made in this area. Centrally, guidelines have been developed and training on improving data quality has been organised, and several organisations have appointed data managers to coordinate the relevant activities. The main obstacles to improving the quality of databases are the lack of resources and domain-specific knowledge.

Ensuring AI knowledge and skills

37. The survey of the National Audit Office revealed that there are not enough people with sufficient technical knowledge to successfully develop AI solutions and to order or formulate what AI solution needs to be created.

Lack of AI knowledge among employees is an obstacle to the creation of AI solutions

38. Employees, who are engaged in the organisation's main processes on a daily basis, are often the ones who can identify and suggest new ideas for the initiation of AI solutions. They know the details and specific needs of their work the best, and can therefore suggest how to improve work processes and develop AI solutions. For employees to perform their role effectively, it is essential that they have the necessary knowledge of AI capabilities and the skills to identify and formulate needs in a manner that supports the creation of solutions. Interviews with ministries confirmed that there are not many ideas coming from

[12] Government of the Republic Regulation No 88 "Fundamentals of organisation of services and information management", adopted on 25.05.2017.

employees and sectoral specialists for the creation of possible AI solutions.

39. The lack of knowledge of AI possibilities and areas of implementation among employees is an obstacle to the development of AI solutions. The survey by the National Audit Office also revealed that one of the obstacles to the development of AI solutions is the lack of AI knowledge of among employees. Twelve of the organisations that responded to the survey claimed that the lack of adequately qualified staff is an obstacle. If the employees lack an understanding of what AI can do and how it can be implemented, projects often remain at level of an idea and solutions are not developed or commissioned.

40. Increasing knowledge in the field of AI requires that employees are consistently provided with meaningful training to develop their skills in using AI. The target set in the AI strategy is to train 500 public sector managers and employees in this area per year.

41. The challenge in the case of training programmes is to train employees in a situation where they lack IT and data background and knowledge and where the area of artificial intelligence seems complicated. There are accessible training programmes and the organisations are also interested in them. The survey revealed that 36 organisations (75% of respondents) have made training their employees to improve data quality a priority, but also they also acknowledged that training is difficult.

Legal constraints and ethical considerations

42. The public sector carries a great responsibility in the development of AI solutions, because they must be developed in a responsible and transparent manner. All applicable legislation must be taken into account and, among other things, the development and use of solutions must comply with the Administrative Procedure Act, the Public Information Act and the Data Protection Act. There is no separate regulation on the development and use of AI in Estonia yet, but there are plans to develop a national regulation on AI in the near future, specifying the organisation of the field (see paragraph 63).

Legal constraints on the development of AI generally relate to the use of personal data

43. Many organisations have difficulties in meeting the regulatory requirements upon the creation of AI solutions and this has delayed or interrupted the development of solutions. Difficulties mainly arise from data protection rules that limit the use of personalised data both in the training of AI solutions as well as in the use of these solutions. Also, organisations do not know data protection rules well enough and are therefore more likely to just abandon their activities.

Examples of keywords to ensure transparency:

- traceability – the data sets and processes that are the basis for the decisions of the AI system must be documented;
- explainability – the ability to explain, in a timely and adapted manner, both the technical process of the AI system and the decisions and choices made by humans, e.g. why such a solution was chosen;
- information exchange – an AI system must not present itself as a human, and the user must be offered the possibility to communicate with a human when compliance with fundamental rights must be ensured.

Examples of keywords to ensure responsibility:

- auditability – making it possible to assess algorithms, data and the design process;
- minimisation and notification of negative impacts – the user must be notified of the potential impact of the outcome and the AI developer must carry out an impact assessment;
- legal protection – if the effects of the system are unfairly harmful, mechanisms should be put in place to ensure adequate legal protection.

Source: Commission Expert Group on AI[13]

44. Developing AI models often requires the use of large amounts of data. Large amounts of data allow models to learn and thus provide more accurate information for decision-making. However, a lot of the data used by public sector organisations is personalised and these are exactly the kind of data the use of which for the development and implementation of AI models is restricted due to data protection.

45. There must be a lawful basis for the processing of personal data. This could be, for example, a need arising from a contract or the consent of the individual. This means that without a clear process in place to justify data processing, the use of (personalised) data is not allowed. For example, in the health care sector, patient data can only be used once a treatment process, such as a doctor's appointment, has been initiated. The use of the data of patients in an AI solution without a legal basis is prohibited.

46. While the use of personalised data in AI solutions can bring speed and cost savings to certain decision-making processes, it also raises ethical questions and risks. In the creation of the present solutions, they are mostly related to transparency and assignment of responsibility, and will become more prominent as these solutions are more broadly implemented.

47. In the case of AI solutions, it is necessary to ensure the transparency of its operating processes and it must be clear who is responsible for the data used in the solutions and the decisions provided by the solution. The lack of transparency can generate significant risks, such as wrong or discriminating decisions, as the decision-making process is not repeatable and the way AI made the decision may not be verifiable. In order to mitigate the risks, each organisation must prepare a risk assessment and an impact assessment describing the maximum potential harm resulting from a security breach of an AI system and the impact of decisions made by the system on the fundamental rights of people.

IT infrastructure

48. The existing IT infrastructure (the computer system and the hardware and software environment that supports software development) have been used for the development and maintenance of AI solutions at present[14]. The AI solutions currently in development and use tend not to set specific IT infrastructure requirements and this has not been a significant obstacle to the development of solutions. However, in the future, as solutions are developed more widely and data

[13] Ethical guidelines for the development of trustworthy artificial intelligence.

[14] ISO/IEC/IEEE 24765.

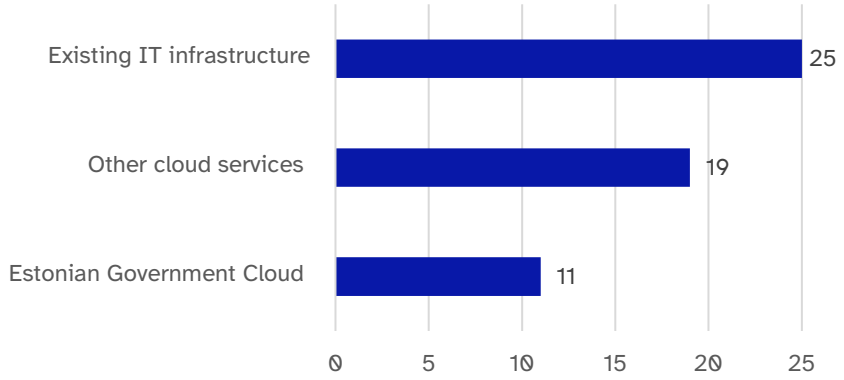
volumes increase, we must also be prepared to build IT infrastructure with higher performance and other specific needs.

49. The goal to develop infrastructure on the basis of the government cloud and to prepare a plan for this is separately highlighted in the last two National AI Strategies (Kratt Strategy) (2022–2023 and 2024–2026). As the first step, the National AI Strategy for 2022–2023 outlines the creation of a roadmap or action plan for the development of common infrastructure and services based on the government cloud (deadline September 2023). However, in the AI Strategy for 2024–2026, the goal of creating a roadmap has been postponed by one year and it has not been created yet. According to the Estonian Information and Communication Technology Centre, the creation of the roadmap is at the analysis stage and it is unclear whether this analysis could lead to real solutions in the future.

No separate IT infrastructure is currently needed for the development of AI

50. In the view of AI solutions, the government cloud is currently mainly used to host the Bürokratt [2]solutions of organisations. In general, the same infrastructure used for other IT solutions is also used for the implementation and development of AI solutions (see Figure 5).

Figure 5. What kind of IT infrastructure is implemented for the development and use of AI solutions (opinion of the 48 organisations that responded to the survey, broken down by responses)?



Source: Survey by the National Audit Office

51. In addition to IT infrastructure, performance is also an important aspect in the development of AI solutions. Organisations often do not have the money needed to use the high-performance computing (HPC) solutions needed to run more complex models. This, in turn, reduces the capacity to develop and implement large-scale AI solutions.

Ensuring the security of AI solutions

52. There have been no reports of major security incidents involving AI solutions. However, more attention should be given to the secure use of both domestic solutions and foreign ready-made solutions in public sector organisations.

53. The AI assessment section APP.EE.2 “Artificial Intelligence Systems”[15] has been added to the Information Security Standard of the E-ISS created for implementation by public authorities. It includes 22 measures in total. Under the main measures, it is possible to find information on planning the implementation of AI systems, validation of models, inputs and outputs, incident management, as well as confidential data and more.

54. The E-ISS outlines who is responsible for enforcing the security measures for AI systems. The main responsibility lies with the IT department of an organisation. The organisation’s management, the chief information security officer, the data protection officer, the compliance manager and the developer are also responsible. The circle of people is big, as the organisation has to know what technology is being used, how and for what purpose.

55. Although the National Audit Office is not aware of any incidents related to the use of artificial intelligence in Estonia so far, the existence of risks in this area must be taken into account. E-ISS requires that an institution must be prepared to detect, report, resolve, escalate and document incidents.

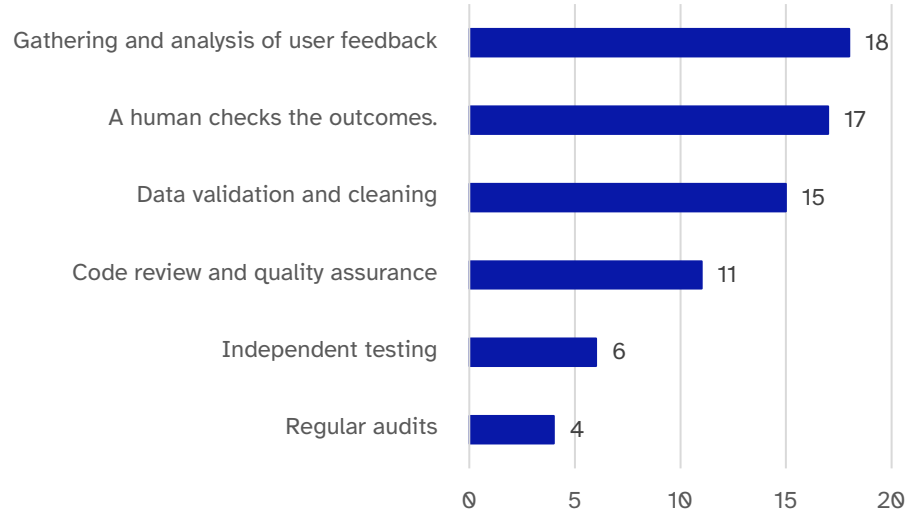
The risks associated with the development and use of artificial intelligence are largely known

56. The risks associated with the development and use of AI solutions or the use of the data they contain are largely known. The survey of the National Audit Office revealed that 29 institutions (60% of the respondents) confirmed that they had assessed such risks. Twenty-two organisations use a separate risk analysis for this.

57. However, the survey revealed that in the organisations where AI solutions had been created, the quality and correctness of the solutions were mostly checked retroactively. The majority of the organisations obtained information for this through user feedback or by checking the outcomes of the solution (see Figure 6).

[15] Draft Estonian Information Security Standard 2024.

Figure 6. How do organisations ensure the correctness and quality of the AI solutions or algorithms it created? (number of organisations who chose the answer)



Source: Survey by the National Audit Office

58. Also, while 41 of the organisations that responded are using ready-made foreign AI solutions, 33 do not yet have internal procedures on how to use these solutions correctly and securely. The lack of a procedure creates the situation where employees do not know which activities are allowed and which are not, which in turn can lead to data leaks or unauthorised access to data.

European Union Artificial Intelligence Act

59. Regulation 2024/1689 of the European Parliament and of the Council on artificial intelligence was formally approved by the European Parliament on 13 March 2024 and entered into force on 1 August 2024.[16] According to the European Union Artificial Intelligence Act, AI solutions must meet high ethical and security standards. The Act sets deadlines by which solutions must comply with the standards of the European Union and national sectoral preparedness must be established.

A human-centred approach to AI seeks to ensure that human values are paramount in the development, implementation, use and monitoring of AI systems.

Source: Ethical guidelines for the development of trustworthy artificial intelligence

60. The Act divides AI solutions into four risk categories: minimal, limited, high and unacceptable risk (see Table 3). The Act sets requirements for solutions based on the level of risk – the higher the risk level, the more restrictions there are. If the risk is the highest, i.e. unacceptable, the Act prohibits the use and development of such a solution.

[16] EU Artificial Intelligence Act or the AI act.

Table 3. Risk levels of the EU AI Act and examples of solutions that could fall into the corresponding risk category

Risk level	Description	Examples of solutions
Unacceptable risk	Divides AI solutions into 8 different categories that are incompatible with EU values and rights. Such solutions are prohibited in the Union.	Detecting human emotions using an artificial intelligence solution.
High risk	High risk includes security components of products already regulated and stand-alone AI systems in certain areas. The solutions may potentially have negative impacts on human health and safety, fundamental rights or the environment. High-risk solutions are regulated the most.	AI solutions integrated into medical devices, lifts, vehicles, other machines and critical infrastructure; automated processes that involve personal data processing; safety devices of products.
Limited risk	Includes solutions exposed to the risk of manipulation or wrong decisions. Such solutions will be subject to the obligation to inform the user that the solution is an AI solution in order to ensure transparency.	Chatbots.
Minimal risk	Includes solutions that do not fall into any of the above risk categories. No additional restrictions are applied to solutions with minimal risk.	Spam filters.

Source: National Audit Office, European Commission (https://digital-strategy.ec.europa.eu/et/policies/regulatory-framework-ai)

61. According to the survey carried out during the preparation of the overview, organisations have mostly rated the risk level of their AI solutions as low, with a few organisations rating the risk as high.

62. The European Union Artificial Intelligence Act prohibits the use of solutions with an unacceptable risk level as of February 2025. New regulations concerning new high-risk solutions will be added as of August 2026. These regulations will apply to all high-risk solutions as of August 2027. These regulations will apply to all solutions that have been created and will be created as of August 2030.

63. A national regulation on artificial intelligence is being prepared under the leadership of the Ministry of Justice and Digital Affairs, which will clarify the organisation of the area (supervision, penalties, etc.). According to the plan, the draft act on the implementation of the on AI Act should be ready and submitted for approval in the second quarter of 2025, and the draft act on the amendment of the Administrative Procedure Act should be submitted to the Government in 2025. Amendments to the Public Information Act are not currently on the agenda and it is not clear what the timeframe for these amendments will be. In Estonia, national legislation will be amended in the near future,

and hopefully this will make it clearer for both the organisations and the public what is and is not allowed in the development of artificial intelligence.

(digitally signed)

Ines Metsalu-Nurminen
Director of Audit, Audit Department

Characteristics of the overview

Purpose of the overview

The objective of the overview is to describe how public sector organisations use and develop solutions based on artificial intelligence. Among other things, the focus will be on the prerequisites, obstacles and use cases concerning the creation of AI solutions.

The results of the overview will be covered in the summary report of the joint audit organised by the European Organisation of Supreme Audit Institutions (EUROSAI).

Scope and focus of the overview

The overview covers the period from 2016 to 2024.

Main questions of the overview:

- Is there a strategy and implementation plan for the development of artificial intelligence?
- Are there regulations that set rules for the development and use of artificial intelligence solutions?
- Have activities been planned for the management and improvement data quality in databases, which are necessary for the implementation of artificial intelligence solutions?
- Is there an IT infrastructure for the development and implementation of artificial intelligence solutions and what is it like?
- How are risk management and ensuring security for solutions guaranteed in the development and use of artificial intelligence?
- What kind of AI solutions have been implemented in public sector organisations?

The review included an analysis of documents, an online survey and interviews with various parties.

Analysis of documents

The analysis of documents was based on the following documents:

- the Estonian Artificial Intelligence Strategy (Kratt Strategy) for 2019–2021;
- the Estonian Artificial Intelligence Strategy (Kratt Strategy) for 2022–2023;
- the Artificial Intelligence Strategy for 2024–2026;
- White Paper on Artificial Intelligence and Data for 2024–2030;
- the Data Strategy for 2024–2025;
- Digital Agenda 2030.

Online survey and interviews

An invitation to the online survey was sent to 58 organisations, including ministries, public authorities, constitutional institutions, foundations established by the state and legal persons governed by public law. Forty-eight organisations responded to the survey (see Table 4).

Table 4. Organisations that responded to the survey

Organisations that answered the questions	
Ministry of Education and Research	Agriculture and Food Board
Education and Youth Board	Agricultural Registers and Information Board
Language Board	Ministry of the Interior
National Archives	Emergency Response Centre
Data Protection Inspectorate	Rescue Board
Estonian Forensic Science Institute	IT and Development Centre of the Ministry of the Interior
Patent Office	Ministry of Social Affairs
Prosecutor's Office	State Agency of Medicines
Ministry of Defence	Social Insurance Board
Defence Resources Agency	Health Board
Ministry of Climate	Ministry of Foreign Affairs
Environment Agency	The Government Office
Environmental Board	Supreme Court
Information Technology Centre of the Ministry of Environment	Office of the Riigikogu
Environmental Investment Centre	Office of the Chancellor of Justice
Transport Administration	Estonian Public Broadcasting
Ministry of Culture	Estonian Unemployment Insurance Fund
Ministry of Economic Affairs and Communications	Agriculture and Food Board
Estonian Information and Communication Technology Centre	Agricultural Registers and Information Board
State Infocommunication Foundation	Ministry of the Interior
Estonian Information System Authority	Emergency Response Centre
Consumer Protection and Technical Regulatory Authority	Rescue Board
Labour Inspectorate	IT and Development Centre of the Ministry of the Interior
Ministry of Finance	Ministry of Social Affairs
Tax and Customs Board	State Agency of Medicines
IT Centre of the Ministry of Finance	Social Insurance Board
Financial Intelligence Unit	Health Board
Shared Service Centre of the State	Ministry of Foreign Affairs
Ministry of Regional Affairs and Agriculture	The Government Office
Land Board	Supreme Court
Rural Development Foundation	Office of the Riigikogu

The list of interviewees is given in Table 5.

Table 5. Interviewed parties

Interviewed persons	Organisation	Time of interview
Ott Velsberg – Head of Data	Ministry of Economic Affairs and Communications	10.07.2024
Markko Liutkevičius – Head of the Machine Learning and Language Technology Unit	Estonian Information System Authority	16.07.2024
Jaanika Merilo – eHealth Strategy Manager	Ministry of Social Affairs	09.09.2024
Ott Karulin – Head of State Governance Kaur Karus – Head of Data	Ministry of Finance	14.10.2024
Risto Raaper – Head of ICT	Ministry of Culture	29.10.2024
Gerli Köösel – Leader of Bürokratt Urmas Sinisalu – Head of the National Library Services Centre	National Library	29.10.2024
Evar Sõmer – Advisor to Secretary General Henrik Trasberg – Advisor of the Legal Policy Department	Ministry of Justice and Digital Affairs	06.09.2024
Sten Kapten – Education Innovation Advisor, General Education Curricula and Courseware Raina Loom – Head of Legal and Personnel Policy Department Margit Grauen – Head of Digital Courseware Riin Saadjärv – Advisor on General Education Curricula and Courseware	Ministry of Education and Research	11.10.2024
Tanel Tera – Head of Business Services Department Martin Õunap – Chief Architect	Health and Welfare Information Systems Centre	09.09.2024
Ivo Tamm – Head of IT Department Mario Liimann – Software Architect Mariell Viinalass – Development Advisor/Business Architect	Agricultural Registers and Information Board	10.10.2024
Alvar Pihlapuu – Head of Development Department	Tax and Customs Board	17.12.2024

Overview completion date

The overview was completed on 17.12.2024.

Overview team

Audit Manager Toomas Viira, auditors Hanna Kätlin Ardel, Jevgeni Lazartšuk, Alo Lääne.

Contact information

Further information on the audit is available from the Communication Unit of the National Audit Office: telephone: +372 640 0777; email: riigikontroll@riigikontroll.ee

An electronic copy of the audit report (PDF) is available online at www.riigikontroll.ee.

A summary of the audit report is also available in English.

The number of the audit report in the record management system of the National Audit Office is 80157.

The postal address of the National Audit Office is:

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Earlier audits by the National Audit Office in the area of data

02.02.2023 – Database access management

29.04.2020 – Availability and use of data for smart state management (memorandum)

All reports are available on the website of the National Audit Office at www.riigikontroll.ee.