

A Nordic initiative for research and innovation on responsible and ethical use of Artificial Intelligence

A discussion paper for the Nordic Heads of Research
Councils (NORDHORCS)

Dear reader,

This is a discussion paper for a meeting of the heads of the Nordic research funding organisations (NORDHORCS) and the NordForsk board in March 2024. The discussion paper served as a starting point for conversations regarding joint Nordic work on the responsible and ethical use of Artificial Intelligence (AI). It was NordForsk's goal to provide inspiration for an ambitious multi-tool initiative capitalising on the advantages and full potential of Nordic collaboration. The meeting discussed the proposal and agreed that a Nordic initiative on responsible and ethical use of AI would have clear added value for the Nordic region. NORDHORCS asked NordForsk to invite the national research councils to nominate members to a committee of a Nordic Artificial Intelligence Collaboration (NAIC). NAIC will be a structure for developing call(s) for research and innovation and sharing of best practices and experiences of AI in research funding. The committee will jointly develop the initiative and elaborate on the ambitions and plans.

Research and innovation is essential to build an improved understanding of how artificial intelligence can be deployed and used responsibly, to understand its societal consequences, to fully appreciate the possible ramifications of misuse, and to take advantage of its significant potentials in its numerous areas of application. It is critical that the development and implementation of regulatory frameworks and guidelines are informed by research to enable the full capitalisation of the advantages of AI and the mitigation of problematic consequences for Nordic societies.

NordForsk believes that the initiative should have significant Nordic added value to the research and innovation communities, Nordic research and innovation funders as well as the Nordic societies in general.

A Nordic initiative should respond to societal challenges that the Nordic region is facing and include AI specific challenges with a clear Nordic added value such as the consequences of AI generated content on democratic discourse, trust in content, and digital literacy. The development of AI technology is outside the remit of the initiative.

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The horizon scan on EU initiatives and national AI strategies have been done in collaboration with Edberg & Vittrup.

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Executive summary

The Heads of the Nordic research funding organisations (NORDHORCS) is interested in exploring a joint Nordic call on AI and has asked NordForsk to produce a suggested outline for an initiative to be discussed at the NORDHORCS meeting March 18th, 2024. This discussion paper presents NORDHORCS with background material, scenarios, and recommendations as a starting point for the deliberations.

Preparing the discussion paper NordForsk has briefly mapped and analysed ongoing and planned activities, priorities and strategies on national, Nordic and EU level. As the development of AI and the use of AI tools is rapidly and constantly changing, this work should be considered as cases and examples of importance more than as a fixed starting point.

With regards to priorities within the framework of the Nordic Council of Ministers and Nordic Council there is currently a focus on ethical and responsible use of AI in the context of democracy, sharing of data, knowledge and expertise as well as the need for capacity building. The EU has large funding schemes for AI research and innovation activities and is currently reaching the final stages of approval of the legislative AI Act. AI is clearly also a priority for the Nordic countries with national strategies and funding for research and innovation.

The NordForsk administration presents two scenarios for funding of research and innovation activities at the Nordic level in this paper. Calls could be either open, with a degree of focus, or with a more thematic scope focusing on areas of Nordic added value. NordForsk also outlines some recommendations for NORDHORCS to consider. NordForsk recommends establishing a Nordic initiative for research and innovation on responsible and ethical use of AI. The initiative could have a multi-tool approach, with activities such as calls, workshops, working groups addressing different needs and purposes on various levels. The NordForsk administration is prepared to allocate personnel resources to coordinate a Nordic multi-tool initiative on AI consisting of variety of activities and proposes to establish a committee consisting of interested funders with the mandate to develop and flesh out the activities and tools that an initiative would consist of.

The NordForsk administration believes that there are sound arguments for funding joint primary research and network activities in this area. A working title for the initiative is NAIC – Nordic Artificial Intelligence Collaboration. Considering that AI has relevance for and impact on all sectors of society and is rapidly evolving in unpredictable ways, capacity building among research and innovation communities is central for developing sound and informed responses and governance structures. An added value of Nordic initiatives is that they can be fast and flexible and address Nordic common priorities and needs. In addition, NordForsk recommends activities for competence building and knowledge sharing between funders. NordForsk recommends focusing on identifying instruments and thematic scoping with the broadest possible support and ambition among the funders within the timeframe indicated in this discussion paper.

Remit

At the NORDHORCS meeting on October 23rd the topic of artificial intelligence was discussed in regard to status in the Nordic countries and a joint call. Each country gave an oral status and information on what is being done on AI in their country. AI is an area that is prioritised in several countries, with significant governmental funding. The meeting also discussed the use of AI in research and grant evaluation, linked to GDPR and data storage concerns as well as the possibilities it brings for recruitment of experts. Several of the national guidelines for research conduct and research integrity are being updated to include AI and security aspects.

NORDHORCS is interested in exploring a joint Nordic call on AI. The meeting agreed that the call should not look at the technology per se. The initiative should include both public and private sectors and public-private partnerships (PPPs). The importance of the ethical dimension was raised, and the research could explore which barriers the Nordic societies must overcome to release the potential in a Nordic setting.

The following action was decided: The NORDHORCS members will discuss within their organisation the idea for a call on the consequences and potential of AI in the Nordic societies. NORDHORCS also asks NordForsk to come back with a suggested outline for an initiative to be discussed at the March meeting 2024. This discussion paper is NordForsk's response to the task from NORDHORCS.

Background

In recent years artificial intelligence (AI) has gained increasing and significant traction. Applications have been rapidly expanding and accessibility is available to virtually anyone with an internet connection. The growth of AI is largely fuelled by significant breakthroughs in computing power, such as the introduction of faster, more efficient processors and advanced Graphics Processing Units (GPUs). In parallel, there has been a surge of data, acting as a vital resource for AI systems to learn, adapt, and progress. The widespread availability has been a catalyst for advancements and innovations in diverse sectors globally, marking a new era of technological integration and advancement. The United States of America and China have established themselves as leaders and competitors in the race for developing technological advancements in AI, and the EU has been leading in developing regulation over the last few years emphasizing the need for oversight in AI deployment and development. The technological development and its global accessibility have been so rapid that experts, government, companies, and lawmakers are now calling for increased regulation. Some are even calling for a pause in the development of the technology and/or its deployment.

As a result, regulatory frameworks are emerging around the globe. In 2019, the OECD AI principles were adopted, including five value-based principles and five recommendations for OECD countries to promote responsible and trustworthy AI policies (OECD 2019). More recently in the US, President Joe Biden has issued an executive order on safe, secure, and trustworthy AI (The White House 2023). This order reflects a growing recognition of the importance of balancing innovation with safety and ethical considerations. The European Union has developed the AI Act that is designed through a risk-based approach, establishing obligations for providers and users depending on the level of risk from AI (The European Parliament 2023). This approach seeks to ensure that AI development aligns with safety standards and ethical principles, particularly in high-risk applications. In November 2023, the UK held a global AI safety summit which resulted in The Bletchley Declaration on AI safety, recognising the urgent need to understand and collectively manage potential risks and ensuring AI is developed and deployed in a safe, responsible way (The AI Safety Summit 2023). There was also agreement on the need for collaboration on testing the next generation of AI models against a range of critical national security, safety and societal risks.

Safety concerns surrounding AI and digital technologies have also featured in discussions at the Nordic level, most recently at the Nordic Council Session in Oslo in October 2023. The Icelandic Prime Minister Katrín Jakobsdóttir argued in her speech that: "AI will impact all sectors of society, and the technology is developing much faster than political decisions can be made in this area. We must act immediately, because democracy itself is vulnerable. It must be cared for and protected at all costs." Safety concerns were also raised by High Level Swedish representatives in relation to threats to democratic norms and the international reputation of Sweden. Coordination around the development of ethical and regulatory frameworks for AI at various levels, such as the Nordics, was raised both by the Swedish Prime Minister Ulf Kristersson and the Secretary General of NATO, Jens Stoltenberg.

These regulatory efforts signify a global shift towards a more structured and responsible approach to AI development. They aim to harness the benefits of AI while ensuring its alignment with ethical standards, safety, and societal well-being. As the field of AI continues to evolve, these frameworks are expected to play a crucial role in shaping its future trajectory, balancing innovation with responsibility and oversight. However, the uncertain nature of technological development, its uptake and regulation as well as the geopolitical situation (in which AI plays a significant role) introduces significant uncertainty in the prediction of future trajectories.

What is AI and ethical AI?

There is no commonly agreed upon definition of AI. However, in November 2023 the OECD updated its definition to reflect recent scientific developments: "An AI system is a machine-based system 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. Different AI systems vary in their levels of autonomy and adaptiveness after deployment."

There is no unanimous and precise definition for "ethical AI", only different definitions as well as underlying requirements and principles published by different institutions that relate to ethical AI (e.g. EC's EU High Level Expert Group on AI's seven key requirements forming the foundation for the EU AI Act Proposal, OECD, UNESCO). For instance, in 2019 the EU High-Level Expert Group on AI presented Ethics Guidelines for Trustworthy Artificial Intelligence based on seven key requirements: 1. Human agency and oversight 2. Technical robustness and safety 3. Privacy and data governance 4. Transparency 5. Diversity, non-discrimination and fairness 6. Societal and environmental wellbeing 7. Accountability (The European Commission 2019).

Recent developments and possible future directions

AI has been developed during a relatively long time. The last 10-15 years deep learning systems have been programmed to identify and classify images and objects, transcribe audio material and to understand meaning in sentences. The technology has now been developed to use classifications to predict and generate new material, so called Generative AI. Large language models (LLM's), a prominent example of Generative AI, harness vast amounts of data from the internet to produce new, high-quality material. These models have become increasingly accessible on a global scale, marking a new era in AI utility and influence.

The future trajectory of AI may include advancements in AI planning and imagination. These capabilities could enable AI systems to simulate complex scenarios, devise creative solutions to problems, and even generate innovative ideas and designs. This evolution could significantly enhance decision-making processes, creative industries, and problem-solving methodologies. Artificial General Intelligence (AGI) is often considered the possible end product of AI advancements, with capabilities similar to humans (such as creativity and abstract thinking) but with vastly enhanced performance due to its ability to access and process immense sets of information at speed.

Concerns and implications

Significant concerns have been raised around the application of this powerful technology, including issues around bias (such as discriminatory, harmful and sexist content), transparency, privacy, authenticity, and copyright. Harms can be unintended, for example when AI is used for purposes it was not intended for or through incorrect information produced by the technology. There can also be intended harms produced by malign operations, such as spreading misinformation and using fake identities. As AI is increasingly used in many areas of societies, it may have wide ranging and disruptive consequences. A commonly discussed area is the labour market, and in a recent report from the World Economic Forum employers predict that 40% of skills required in the workforce will change in the coming five years and that a quarter of all jobs will be affected by AI, either created or destroyed (World Economic Forum 2023). See Annex 1 for a more comprehensive list of concerns and implications of AI on society.

As AI continues to evolve and integrate into many aspects of our lives, it is crucial to address these challenges and concerns. Ensuring responsible development and deployment of AI technologies will be key to maximizing their benefits while mitigating risks. This requires a concerted effort from researchers, policymakers, technologists, ethicists, and the broader community to navigate the complex landscape of AI's future impact on society.

Research and innovation and the Nordic context

Research and innovation is essential to build an improved understanding of how AI can be deployed and used responsibly, to understand its societal consequences, to fully appreciate the possible ramifications of misuse, and to take advantage of its significant potentials in numerous areas of application. It is critical that the development and implementation of regulatory frameworks and guidelines are informed by research for us to be able to capitalise on the advantages of AI and mitigate problematic consequences for societies.

Governments and research and innovation funders are reacting to these developments. Notable examples include a number of AI focused calls issued by Vinnova in 2023, an earmarked budget of 100 million DKK for AI R&I calls organized by Innovation Fund Denmark in 2024 and a 5 years budget of 1 billion NOK to the Research Council of Norway for a funding scheme with a mandate of research on consequences of AI and other digital technologies for society, digital technology as a research area in itself, and research on how digital technologies can be used for innovation in private and public sectors.

In this context NordForsk is delighted that NORDHORC has tasked us to develop a suggestion for a research and innovation initiative for AI to address shared Nordic concerns and priorities in the area.

National AI strategies 2017-2023

The first EU AI strategy was introduced by the EU Coordinated Plan on AI in 2018. The ambition was to make EU a world-class hub for AI and ensuring that AI is human-centric and trustworthy. In the plan all EU member states were encouraged to produce national AI strategic plans. The EU AI strategy also set the path for how AI initiatives should be integrated in the coming Horizon Europe and Digital Europe programmes (2021-2027) as well as for AI Act drafted in 2021 and approved by the EU Parliament December 2023. Following this recommendation the Nordic countries each developed their national AI strategies, reflecting their unique approaches and priorities in AI development. In some cases, the first national strategies have been updated with more specific sector-oriented strategies. Several countries are also preparing new digital strategies. See Annex 2 for a more detailed description of the national AI strategies.

Finland's AI Strategy (2017, 2018, 2020)

Finland's approach emphasizes business competitiveness through efficient data use, rapid AI adoption, and developing top-tier expertise. The strategy also stresses AI's role in public services and security preparedness, aiming to establish Finland as an AI leader. This strategy balances technological innovation with ethical considerations, aiming to leverage AI for economic growth and societal advancement. The Finnish AI strategy was further elaborated and updated in 2018 and in 2020.

Sweden's AI Strategy (2018)

Sweden's AI strategy is broad and emphasises utilizing AI for societal and economic gains. It prioritizes education, training, and research in developing AI competencies and addresses concerns like data bias, transparency, and ethical AI usage. The strategy encourages cross-sector collaboration to enhance Swedish competitiveness and welfare, aiming to use AI responsibly and innovatively. In December 2023 the Swedish government initiated an AI commission in order to strengthen Swedish competitiveness.

Denmark's AI Strategy (2019)

Denmark's strategy is comprehensive, positioning the country as a leader in ethical and responsible AI development. It focuses on enhancing AI capabilities in the business sector and public services, underlining a commitment to ethical principles and digital competencies. Key goals include increasing AI investment, especially in healthcare and transportation, embodying Denmark's vision of balancing technological progress with ethical considerations for societal welfare.

Norway's AI Strategy (2020)

Norway's AI strategy emphasizes the use of AI for economic growth and societal benefits focusing on ethical and human-centric AI development. It tackles issues like data privacy, bias, and transparency. The strategy promotes AI integration across sectors such as healthcare, energy, and public administration, highlighting the need for digital competencies, innovation, infrastructure and cybersecurity. Norway seeks to balance technological advancement with ethical considerations, aspiring to be a leader in responsible AI usage.

Iceland (2021)

Iceland's policy on Artificial Intelligence was published in 2021 but without an English version. The policy's key objectives are to build and maintain a strong ethical basis for the development and use of AI, based on good knowledge of the technology while understanding the security challenges it entails.

Other Nordic Countries

The Faroe Islands, Greenland, and Åland do not have distinct AI strategies. Science policy is within the sovereign policy domain in case of Greenland and the Faroe Island. However, these countries have been consulted with in the course of the work with this paper, and they report that they are following the development of AI and are interested in participating in Nordic cooperation in this area.

Summary

Some common threads in the national strategies include the recognition of the potential of AI for economic growth, innovation, and increased competitiveness. There is a desire to use AI to benefit various sections of society, such as the welfare and public sectors. The strategies also emphasise the importance of fostering and attracting skillsets and competencies to enable the capitalisation and development of responsible AI and minimise risks and harmful consequences. Investments in research and innovation and improving data and infrastructure is also a common feature.

The EU AI Act

"Putting together a comprehensive list of AI risks for all time is a fool's errand. Given the ubiquitous and rapidly evolving nature of AI and its use, we believe that it is more useful to look at risks from the perspective of vulnerable communities and the commons" (The UN 2023).

"The European AI strategy and the coordinated plan make clear that trust is a prerequisite to ensure a human-centric approach to AI: AI is not an end in itself, but a tool that has to serve people with the ultimate aim of increasing human well-being." (The European Commission 2019)

On 9 December 2023, the European Parliament and the Council reached a political agreement on the AI Act¹. The AI Act is a comprehensive legal framework designed to regulate the use of AI across member states. The final compromise text approved by the Council of Ministers and the EU Commission was published the 21st of January 2024. On the 10-11 April 2024 there will be plenary vote on the AI Act in the European Parliament, followed by a formal AI Act adoption and a step wise process of implementation of for example prohibited AI practices, codes of practice and the EC AI Pact (support for companies in planning for AI Act). The newly established European AI Office will play a key role in implementing the AI Act, fostering the development and use of trustworthy AI, and international cooperation.

The main objective of AI Act should, according to the compromise text, be to "promote the uptake of human centric and trustworthy AI" respecting fundamental rights, democracy, safety, health, the rule of law and a high level of safety. This is underlined in the compromise text in Recital 1, and in Article 1.

To ensure the introduction of trustworthy AI, the AI Act introduces a risk-based approach to AI governance, categorizing AI systems into different risk levels, with the highest risks subjected to veto or strict compliance and transparency requirements. It includes specific provisions for high-risk AI systems, requiring human oversight and robust data governance, while also addressing AI's impact on consumer protection and market surveillance. The Act also includes recommendations to establish national authorities monitoring and approving AI solutions and to introduce national or transnational safe regulatory "sandbox" testing environment for new AI solutions.

Key aspects of the AI Act

- **Risk-Based Approach:** The AI Act classifies AI systems into different risk categories, imposing more rigorous regulations on those deemed high-risk to address potential threats and ensure responsible usage.
- **Legal and Regulatory Framework:** The Act establishes a legal structure for AI deployment, aligning with existing EU laws and principles, ensuring integration of AI technologies within the legal landscape of the EU.
- **Data Governance:** Emphasizing the significance of data quality and privacy, the Act sets forth guide-lines for managing data in AI systems, prioritizing user privacy and data integrity.
- **Transparency and Accountability:** The Act mandates comprehensive disclosure regarding AI operations and decision-making processes. This aspect is crucial for maintaining public trust and ensuring that AI systems are understandable and accountable.

¹

This section is based on the June 2023 proposal discussed and approved by the EU Parliament the 9. December 2023. The consolidated legal text is expected to be published in Q1 2024.

- **Ethical Guidelines:** Central to the Act is the emphasis on ethical AI practices that respect human rights and dignity, guiding developers and users in creating and employing AI in a manner that aligns with societal values.
- **Human Oversight:** For high-risk scenarios, the Act insists on significant human oversight, ensuring that AI does not operate autonomously in situations where its decisions could have critical consequences.
- **Consumer Protection:** The Act specifically addresses the impact of AI on consumers, focusing on safeguarding them from potentially harmful AI practices and ensuring fair market practices.

By addressing these core regulatory topics, the EU's AI Act aims to ensure the safe, transparent, and ethical development and use of AI across the EU. It represents a significant stride in introducing common standards for using AI across member states while upholding ethical and societal values, ultimately striving for a trustworthy and secure AI environment within the EU.

The AI Act and the Nordics

A common legal EU framework for AI is, however, not equivalent to having identical solutions across Europe. For the Nordic countries that are not members of the EU, there will be a separate process assessing whether the AI Act is relevant for the EEA agreement. This process will be carried out after the AI Act has been formally administered at the EU level.

The application of AI solutions depends to a large extent on several national or local factors, such as the level of digitalisation, the organisation of institutions, the national or regional regulations or traditions, and trust in systems. This could turn out to be an advantage for the Nordic countries and in particular for the public sectors, because of the high degree of digitalisation, comparable institutions and common cultural values in regard to trust in society.

The AI strategies of the Nordic countries and the EU's AI Act prioritize trustworthy and ethically responsible use of AI, aiming to protect societies, create economic benefits and drive societal welfare. Despite their alignment in overarching goals, there are notable differences in their approaches and levels of detail. The Nordics are characterised by a high degree of trust in government, the services provided by the public sector, and in society at large. Health and welfare services, education systems and utilities in general are highly digitalised with abundant and relatively easy to access data sources. The Nordic populations are also relatively speaking highly digitally literate. The prerequisites in the Nordics for a successful roll out and implementation of AI could therefore be argued to be good but equally the potential harm is significant if AI leads to for example, an erosion of trust, an increased social polarisation and undermines democracy.

Nordic Council of Ministers and Nordic Council priorities and activities

In August 2019 the Nordic Prime Ministers adopted a vision for Nordic collaboration. The vision is that the Nordic Region will become the most sustainable and integrated region in the world by 2030. To achieve the vision, three strategic priorities have been identified. Initiatives within the frameworks of the Nordic Council of Ministers must contribute to a green, competitive and socially sustainable region. This includes all ministerial councils and Nordic institutions.

AI related issues are particularly well developed and discussed within the frameworks of the Nordic ministerial councils for culture, digitalisation, justice affairs and sustainable growth. Ethical and responsible use of AI is high on the Nordic agenda, including establishing a working group looking into the use of AI tools within the Nordic Council of Ministers' Secretariat.

To improve digital resilience in the Nordic region, the Nordic Prime Ministers have tasked the Ministers for Nordic Co-operation to strengthen Nordic cooperation to track the accelerating development around the use of AI in spreading disinformation in the Nordic countries, seek ways to support the necessary oversight and democratic transparency by securing data access for researchers that monitor the effects of digital technology platforms on democracy, and explore ways how the Nordic countries can jointly strengthen their digital resilience with regards to threats posed by AI to democracy, also in smaller communities at special risk. The Nordic Prime Minister initiative is a continuation of the work done by the [Nordic Think Tank for Tech and Democracy](#) (NMC 2023). The think tank was part of a broader effort by the Nordic Ministers for Culture in their joint work in this field.

A Nordic focus on AI was already put forward with the declaration [AI in the Nordic-Baltic region](#) (NCM 2018) adopted by the Nordic Ministers for Digitalisation May 2018. The declaration states that while AI offers significant potential for the Nordic and Baltic countries in business and public sector activities, challenges should not be underestimated. Even with the high digital maturity of the Nordic and Baltic countries, efforts to better utilise the possibilities of AI will require awareness and consideration of ethical and other risks. Countries that are successful in utilising and realising the benefits of AI, while managing risks responsibly, will have advantages in international competition and in developing more efficient and relevant public sector activities.

The Nordic Council of Ministers for Justice Affairs have conducted a number of pilot activities on the subject of [digitalization of the courts](#) (NCM 2022) The report from the project Public Digitalisation in a legal perspective: Status, challenges and opportunities for Nordic-Baltic cooperation will be published in 2024. In the project leading researchers within law and digitalisation from Norway, Sweden, Finland, Latvia, Estonia, Lithuania, and Denmark will present the fundamental characteristics of digitalising their national public administrations from a legal perspective and will give recommendations on Nordic-Baltic cooperation related to public digitalization. Nordic-Baltic countries possess different specialised expertise and differ from the majority of the EU member states as the Nordic-Baltic countries' public sectors rank among the most digitalised in the world. Recommendations from the project will discuss topics in connection to collaboration between national centres and key environments working around the regulatory sandboxes, cybersecurity regulations and cross-border data sharing, ensuring human rights and reducing biases. The issues of data sharing are also a topic for the [Handbook of cross-border data exchange within the Nordic and Baltic countries](#) with case studies on health services and legal databases (NCM 2023) and other initiatives.

Nordic Innovation is a Nordic institution owned by the Nordic Council of Ministers for Sustainable Growth. Nordic Innovation is currently developing a Nordic AI and data ecosystem, based on the principles of responsible use of data and ethical AI, consisting of several activities:

- Nordic Ethical AI Landscape: [Nordic Ethical AI Landscape | Nordic Innovation](#)
- Nordic Ethical AI Ecosystem: [Nordic Ethical AI & Data Ecosystem | Nordic Innovation](#)
- Nordic Innovation's AI and Data program & Life science program and the MR-Digital: [Applied Ethical AI on Nordic Patient Records | Nordic Innovation](#) & [FederatedHealth: A Nordic Federated Health Data Network | Nordic Innovation](#)

Nordic Innovation has established a [Nordic AI Expert Group](#) consisting of 23 Nordic experts within AI and Data. The expert group is currently working on recommendations connected to five focus areas: data management, research to industry / pilot to production, ethical AI & implementation of regulation, skills and talent, and AI to accelerate sustainability transformation. The expert group will later this year present their recommendations for a Nordic AI strategy, a Nordic centre for responsible AI, foundation models for Nordic languages, a skilled workforce and a competent society, and transparency around the sustainability of AI technologies. As this is work in progress, the recommendations are subject to possible adjustments.

Other relevant efforts within the framework of the formal Nordic co-operation are:

- [Digital inclusion in action](#) project aims to contribute to an inclusive digital transition in the Nordic-Baltic societies by promoting collaboration, dialogue, and knowledge sharing between practitioners and policymakers. The project is administered by Nordregio.
- A range of technologies are transforming value chains and creating well-functioning ecosystems, spanning from AI to Internet of Things, discussed in the report [Datasharing for a circular economy and with relevance for the project Nordic Circular Accelerator | Nordic Innovation](#).
- The [NOBAREG](#) working group contributes to national digitalisation efforts through an exchange of experiences and common approaches to implementation of relevant EU legislation.
- The Nordic Council is currently debating a proposal for recommending a [Nordic Center for AI knowledge](#).
- Relevant research projects supported by NordForsk are:
 - » [Nordic University Co-operation on Edge Intelligence](#)
 - » [Nordic University Hub on Industrial Internet of Things](#)
 - » [Intelligent farming and health control in landbased recirculating aquaculture systems](#)
 - » [Machine learning applied to predicting and preventing production loss in aquaculture \(Digi-Heart\)](#)

The Nordic Council of Ministers' Secretariat, the Nordic Culture Fund and the Nordic Institutions are all looking into how AI can be used in an ethical and responsible way in their administrations. The work is in its pilot stages.

Nordic research and innovation funders strategies, policies, current funding schemes in the area of AI and priorities going forwards

NordForsk sent questionnaires, had meetings with several national research and innovation funders and conducted desk research to build a picture of national investments in the Nordics.

Denmark

The Independent Research Fund Denmark has funded 28 research projects to a value of 90 MDKK in AI in open calls and one thematic call (called Digital technology) since 2019. Some examples of the funded projects include the use of AI in warfare, ethical aspects of AI in the judicial system, clinical use of AI and AI ethics. The fund primarily supports bottom-up research. The fund is currently in the process of updating its strategy for the period of 2024-2026. AI has been suggested as a possible theme for the new strategy and a future thematic call specifically in AI would need to be based on a political decision. The fund welcomes initiatives for exchanging experiences at the funder level in the Nordics. Internally, the fund will prioritise ideas that aim to harness AI for the effectivization of work processes as well as investigations into the ways that AI will influence funding processes, e.g. how applicants might be using AI in their grant applications and how the fund will be able to mitigate these effects appropriately.

Innovation Fund Denmark has funded app. 700 AI projects from 2019-2023 to a value of app. 1,2 billion DKK. The fund co-funded the Digital Research Center Denmark as part of the National Strategy for AI. In 2024, the fund has been tasked with allocating 100 million DKK specifically targeting the research and development of AI, the ethical use of it, the societal challenges and gains that might stem from it, as well as adoption of AI tools by private companies and public institutions. When the new Danish AI strategy is ready funds could be allocated for AI and some of those funds might be allocated through Innovation Fund Denmark. Regarding an upcoming Nordic initiative, the fund explains that ethical and responsible use of AI are major themes of Danish national interest, as are the possibilities of using AI to meet the challenge of shortage of qualified labour in the health care sector specifically and in the society broadly. Another priority is utilizing data, especially public databases in both an ethically responsible way as well as in a way that directly benefit private companies and the development of new products for both the public and private sector. Lastly, the fund seeks attracting talent (researchers and other specialists) within AI to the Nordics and Denmark. The fund would prioritize joint calls and agrees that there is a need for exchange of experiences at the funder level in the Nordics.

The Danish National Research Foundation has co-funded The Pioneer Center for Artificial Intelligence, 2021-2024.

Finland

The Research Council of Finland has funded AI research and research in the application areas of AI with an estimated 315 million euros in 2018-2022. The sum also includes funding granted by the Strategic Research Council. The funding includes flagships and research infrastructures strengthening the ecosystem on AI research in Finland. Most of the funding has been project funding and funding through career instruments strengthening the skills and competence in AI research and application areas. Two flagships focus on AI: Finnish Centre for Artificial Intelligence (FCAI) and 6G-Enabled Wireless Smart Society & Ecosystem. In 2024, the Finnish Center for Artificial Intel

ligence flagship was granted 100 new doctoral positions (25.5 million EUR) to the programme "Finnish Doctoral Program Network in Artificial Intelligence" from the Ministry of Education and Culture.

The Research Council of Finland and Business Finland jointly implemented the research, development and innovation programme ICT 2023 in 2014-2023. The aim of the programme has been to further improve Finland's scientific expertise in computer science and to promote the broad-based application of ICT. In addition, the Council has had several program calls and international joint calls that have been more or less directly related to AI. The Research Council of Finland is, in its strategy, committed to facilitating day-to-day work performance by making use of digitalisation and the best possible tools. For an upcoming Nordic initiative, the Council would like to prioritise multidisciplinary research, and to focus on something unique for the Nordics, such as targeting early career researchers or thematically targeted calls, e.g. AI and the Nordic welfare state. The Council agrees that there is a need for exchange of experiences at the funder level in the Nordics and suggests a webinar series for experts in 2024.

Business Finland used 115 million euros between 2017 and 2021 for R&D&I funding in its AI Business program. Many companies were also funded by industry-vertical programs like Smart Energy, Smart Mobility, Smart Life and Sustainable Manufacturing. The program aimed to increase the Finnish international digital service business by creating a modern B2B platform economy that utilizes AI to create new value from data. The purpose was to provide attractive, low-threshold support for companies through e.g. AI Hubs, PoC-funding, and trainings on AI and platform economy. Business Finland believes that AI will be significant factor in the advancement of other strategic priorities, i.e. carbon neutrality, circular economy, health and wellbeing, and immersive digital life. Business Finland intends to allocate half of its funding to these strategy priority areas over the coming years. Business Finland does not foresee any specific AI calls in the near future, but AI continues to be one of the major factors in many of the applications they receive. For an upcoming Nordic initiative, Business Finland foresees that one of the major challenges is how AI can influence all digital information in the future and the issues of misinformation, fake content, and biased data. Any exchange of experiences at the funder level in the Nordics is most welcome, according to Business Finland.

Faroe Islands

The Research Council Faroe Islands does currently not have funding for AI research. The council has expressed interest in participating in Nordic cooperation in this field.

Greenland

Greenland Research Council does currently not have funding for AI research. The council has expressed interest in participating in Nordic cooperation in this field.

Iceland

The Icelandic Centre for Research- Rannís, has funded 28 research projects to a value of 155 million ISK in open calls. Rannís has a limited area of responsibility when it comes to determining the content of calls but would in principle be interested in research on the ethical use of AI as it can be related to management of grants. Rannís agrees that there is a need for exchange of experiences at the funder level in the Nordics.

Norway

The Research Council of Norway has funded 470 ongoing projects within AI to a value of 2,2 billion NOK. The council has had thematic calls: "Data and services everywhere AI" and "Robotics and autonomous systems" and has funded AI research in open calls with the instruments researcher projects, research driven innovation projects, research centres and collaboration projects. The research covers basic research, industry and innovation, life sciences, health, social security, energy, food, ocean, culture, climate and education. The council has been tasked a government commission to fund research and innovation to a value of 1 billion NOK for 5 years focusing on societal aspects of AI, technology on its own terms and innovation by AI. In addition, the council has ICT-research programs with funding for 200 million NOK/year and plans for investments among other areas in maritime, culture and media. The council would like to priorities research on implementation of AI laws and regulation, ethics of data protection and individual rights, Nordic models of trustworthy AI, effects and consequences of AI, health, digital security and trustworthy and non-discriminating social services in an upcoming Nordic initiative. The council suggests starting the initiative with a call for research networks, followed by a call on the societal aspects of the use of AI. A Nordic activity should mobilise partnerships and build on ongoing activities nationally and in the EU. The same goes for the proposed exchange of experiences at the funder level in the Nordics, these activities need to build on the work of Science Europe and the global research community such as OECD.

Sweden

The Swedish Research Council has funded approximately 50 research projects that are developing AI or using AI-technology to a value of 250 MSEK through open calls. The council has currently no strategy for funding AI research but has guidelines for how AI can be used in applications. There have been no specific calls featuring AI and no thematic AI calls are currently planned. The Swedish Research Council agrees that there is a need for exchange of experiences at the funder level in the Nordics.

The Swedish Research Council for Health, Working Life and Welfare, Forte, has funded 40 research projects within AI, machine learning and algorithmic decision making to a value of 163 MSEK. Some examples of funded projects include prediction of health and illness, AI as decision support in diagnostics and treatment, algorithmic leadership and ethics surrounding use of AI. Forte prefers using the broader concept of digitalisation rather than AI. The council has currently no strategy for funding AI research and have had no specific calls featuring AI but is engaged in a JPI MYBL call featuring amongst other things AI. The council is also discussing developing a call on welfare technology in aged care including digitalisation and AI. Forte sees that there is need for Nordic calls on digitalisation within its areas of responsibility. Forte also agrees that there is a need for exchange of experiences at the funder level in the Nordics, but the working groups need to have a clear purpose and goals to be reported on.

One of *Vinnova's* goals is to accelerate the use of AI in Sweden. Vinnova funds applied research to advance the use AI in selected domains such as health care, climate change, public sector and NGO's. The majority of the funded research has been funded in open calls, where AI is used as part of the innovation, and Vinnova has funded 800 projects in AI to a total value of almost 2 billion SEK since 2008. Vinnova has also funded short term staff mobility, both to and from Sweden, data-labs, and provides basic funding for the establishment of the national AI platform "AI Sweden". Plans for future calls include AI for advanced digitisation, with the observation that AI is today part of most calls, no matter the topic of the call. Vinnova would like to see regulation issues that affects the adoption and use of AI including intellectual property (IP), misinformation, cybersecurity and fraud issues, original work (education, examination, research papers) as well as gender and equality as priorities in a Nordic initiative. Natural language processing and large language models focusing on Swedish and Nordic languages is a responsibility of the Nordic countries. Vinnova agrees that there is a need for exchange of experiences at the funder level in the Nordics."

Formas increasingly includes AI and other supporting technologies in strategies for its various areas of responsibility and in calls. As a joint venture with the Swedish Energy Agency and Vinnova, *Formas* contributed to the call "AI in the service of climate". The call is part of the national research program on Climate and had a total budget of 106 MSEK and funded 17 research projects. The strategic innovation programme Smart Built Environment that *Formas* hosts has had several investments in the area of digitalisation. *Formas* has funded research projects in open calls and thematic calls with AI relevance even though the calls have not had an explicit AI focus, and the proportion of applications using AI has increased in recent years. *Formas* suggests using the broader concept of digitalisation that includes AI and argues that it could make it easier to formulate Nordic added value. Draft suggestions for a Nordic call include AI and climate or other sustainability issues. AI has the potential to contribute to the improvements of various types of knowledge-based planning and decision processes in many areas. Another draft suggestion is "Responsible AI", developing and using AI with ethical considerations, transparency, responsibility, and human well-being. Societal consequences of the implementation of the EU AI Act could be included as well as profiting from the benefits of AI whilst minimising risks, such as integrity, availability, workers' rights and sustainability. *Formas* also thinks that it would be valuable to exchange experiences at the funder level in the Nordics, for example share knowledge on how to promote data sharing in society as well as between countries.

The Wallenberg foundation has committed significant funds to AI research. The WASP programme has funding of 6.2 billion SEK to basic research, education and faculty recruitment in AI, autonomous systems and software. The programme has a capacity building element, with clear ambitions to support doctoral and post-doctoral careers. The WASP-HS programme aims at fostering interdisciplinary knowledge about how AI impacts humanity and society.

Summary

This overview shows that there are extensive investments in AI research and innovation in the Nordic countries. The majority of funding to date appears to be streamed through open calls though there are plenty examples of more targeted schemes. This means that researchers and innovators have mobilised independently of the funders and have identified AI as important areas for their work. Ongoing national policy developments in research and innovation as well as AI specific policy might provide funds for future investments. There appears to be strong support for an upcoming Nordic initiative and funders have identified some themes of special interest, these are reflected in the chapter "Two scenarios for Nordic research and innovation collaboration". There is also strong support for joint Nordic work on developing funding processes considering AI.

EU programmes and initiatives

In the EU White Paper on AI from 2020 it was suggested to implement AI topics and technology in Horizon Europe (2021-2027), Digital Europe (2021-2027) and EU's Structural and Regional Funds. Various AI actions are described in "Coordinated Plan on Artificial Intelligence", 2021.

Within the framework of Horizon Europe and Digital Europe earmarked budgets have been allocated to boost Europe's engagement in digitalization including AI of all industries and sectors of society. On top of the AI earmarked budgets, applicants in all thematic and bottom-up programmes are being encouraged to consider AI and AI supporting technologies. The total investment allocated to AI will depend on the applications. The following brief (not all inclusive) overview of EU programmes and initiatives indicates that billions of euros will be spend on AI activities in the coming years. See annex 3 for more details.

Digital Europe; National Competence Centres (EDIH) and Transnational Testing and Experimentation Facilities (TEF)

The Digital Europe Programme supports the European Union's twin objectives of a green transition and digital transformation while strengthening the Union's resilience and digital sovereignty not to be dependent on systems and solutions coming from other regions of the world. EU's budget is €7,5 billion for the whole programme during 2021-2027. Digital Europe covers several programmes designed to bridge the gap between research and the market/society for digital technology.

Digital Europe focus on 5 key capacity areas: 1. AI, 2. Digital skills, 3. Supercomputing, 4. Cybersecurity and through 5. Regional, national and transnational centers such as National Digital Competence Centers (EDIH) and AI sandboxes in Transnational AI Testing and Experimentation Facilities (TEF). The total EU budget for EDIHs is €330 million and for TEFs €220 million 161 EDIHs and 4 TEFs have so far been funded. There are Nordic participants in 26 EDIHs and in all 4 TEFs.

Horizon Europe: Programmes with a focus on AI technologies or programmes, where AI can be the focus of projects

Horizon Europe is organised around 49 thematic oriented partnership programmes of which most, if not all can include AI elements or topics. In the following only programmes dedicated to AI, AI related R&I or which have a bottom-up approach with a potential to fund AI projects are highlighted.

Pillar I, European Research Council: 4 bottom-up programmes for individual researchers and joint research projects. Fully funded by EU with a budget of €16 billion.

Pillar II, Cluster 4 Digital, Industry and Space. The cluster is an umbrella for several partnerships focusing on digital services.

- The Partnership on Artificial Intelligence, Data and Robotics (ADR) is of particular interest. ADR is a co-programmed (EU funding, partners contribute in-kind), focusing on European sovereignty and leader-ships of ADR technologies with a high environmental, social and economic impact. EU and partners budget is €2,6 billion.
- Chips Joint Undertaking (Chips JU) was approved in 2023. It merges several EU initiatives into one program. Of particular interest is the R&I calls for implementation of AI and other digital technologies. This part of Chips JU was previously known as the Key Digital Technology (KDT) programme. KDT includes several funded projects focusing on AI supported solution. The EU budget for KDT is €1,3 billion, which will be co-funded by national funding agencies with €1,5 billion.

Pillar III, European Innovation Council: Bottom-up programmes for researchers and SME's; EU budget €10 billion for Accelerator, Pathfinder, Transition and €250 million for Eurostars 3 & Innnowwide. Eurostars 3 is co-funded by national funding agencies with an additional €750 million.

Although all Nordic countries are active partners in AI oriented Horizon Europe and Digital Europe programmes and calls, there are no incentives to encourage the establishment of Nordic or Nordic-Baltic consortia. On the contrary, in larger projects it is preferred to have partners from both East, West, North and South to integrate as many countries as possible. In case of the EDIH's, Nordic hubs could be established, but the programme does not encourage cross border hubs.

Two scenarios for Nordic research and innovation collaboration

Qualified knowledge yielded by research and innovation is essential to fully understand the transformative potential and far-reaching consequences of AI. It is also an important prerequisite for successful formulation and execution of appropriate governance structures, policy responses, and interventions. As has been presented in this discussion paper, national governments in the Nordics and the EU through its framework programmes have committed significant resources to research and innovation. However, the response is arguably still in its infancy and the national AI strategies in the Nordic countries point towards the importance of research and innovation, laying a foundation for long term investments. In 2019, the OECD published the policy framework "The OECD AI principles" encouraging governments to work together in international and regional fora to foster international, cross-sectoral and multi-stakeholder initiatives to garner long-term expertise on AI.

"International research collaboration on AI has the potential to accelerate scientific progress by combining knowledge, resources, and expertise from different countries and cultures. It can help address and resolve ethical, social, and political challenges associated with the global implementation of AI technologies on a broader, international scale." (OECD 2023, p 60.)

In this context, the NordForsk administration believes that a regional funding scheme in the Nordics could provide a unique complement to existing investments nationally and in the EU. The Nordic countries are highly digitalised societies with digitally literate populations, advanced industries, and developed e-governance systems, common societal traits, as well as strong university sectors and innovation capacities, providing fertile grounds for research and innovation activities with added value. For example, the Nordic countries are characterised by high levels of societal trust and it is vital that AI is developed, regulated and used in an ethical and responsible manner in order for the trust not to be undermined. In this context the Nordic region has strong potential to be a frontrunner for its own benefit as well as providing a significant contribution to European efforts in the area.

In this section the NordForsk administration outlines the objectives of a Nordic initiative and presents two scenarios for Nordic research and innovation cooperation. In the following section some recommendations for future work are outlined.

Objectives of a Nordic initiative and Nordic added value

The objective of the suggested initiative would be to fund research and innovation activities that address shared Nordic societal challenges in the context of the full-scale use and implementation of AI in the region. The initiative should contribute to mobilisation of capacity and competence building among Nordic research and innovation communities and strengthen networks and collaborations. With increased capacity and strengthened and extended networks, Nordic researchers and innovators would be more competitive in EU framework programmes.

The initiative should have significant Nordic added value to the research and innovation communities, Nordic research and innovation funders as well as the Nordic societies in general. Development of AI technology is outside the remit of the initiative.

A strategic priority of the Nordic Council of Ministers is for the Nordic collaboration to contribute to a green, competitive and socially sustainable region. Responsible and ethical use of AI will be vital in achieving these priorities as well as many of the UN sustainability goals. But to be able release the potential of technology solutions in a responsible and ethically sound way research and innovation is essential.

Capturing the many opportunities presented by AI and developing models for ethical and responsible use would be at the heart of the suggested initiative. The initiative should respond to societal challenges that the Nordic region is facing, such as ageing populations, ongoing structural developments in the labour market, polarisation and the green transition of the economy. The initiative should also address AI specific challenges with a clear Nordic added value such as the consequences of AI generated content on democratic discourse, trust in content, and digital literacy. Inclusionary perspectives should be considered with regards to systemic bias and users at special risk such as children, young people, elderly and disadvantaged people. In addition, the initiative should address various aspects associated with ethical AI, presented in various settings such as the EU High-Level Expert Group on AI Guidelines for Ethically Trustworthy Artificial Intelligence.

With these objectives in mind, the initiative would provide added value in relation to most current EU funding in the area.

Scenario 1: Open call(s) on the consequences and potentials of AI in the Nordic societies

The technological development of Artificial Intelligence is rapidly evolving, and its use and implementation is changing and developing in unpredictable patterns. AI has a very broad application potential, and it is difficult to point to specific sectors that will be more affected than others. This speaks for building in a considerable degree of openness and flexibility into the initiative. An open call would enable the creativity and knowledge of researchers and innovators to identify timely areas where new knowledge is required and would mitigate a potential risk that the initiative would miss out on essential topics or areas of knowledge that the funders could not foresee in advance. An open call could create conditions for excellence and creativity and stimulate research and innovation in a broad set of topics and application areas. An open call would ensure that the joint effort would keep its relevance throughout the process of constructing a call and reviewing applications. It would also require flexibility throughout the lifetime of the funded activities.

A considerable risk with an open call is that NordForsk would receive an unmanageable number of applications, creating an overwhelming amount of work for the administration and the reviewers as well as negatively impacting success rates. The NordForsk administration therefore proposes some actions to focus the call, ensuring relevance and value for money;

Focus on Nordic added value and the EU AI act

The involved funders in the call should develop descriptions of the Nordic added value expected from this initiative. The NordForsk administration has identified three preliminary areas of special Nordic interest based on shared values, social structures and societal challenges in the course of the work with this discussion paper. These areas are described with some more detail under the next scenario.

- The Nordic societal model
- Nordic values, languages and cultures
- Environmental sustainability

These or similar topics of special Nordic interest could also serve as keywords in a call, as in the NordForsk call on Sustainable Development of the Arctic. Applicants would need to describe the Nordic added value and the contribution to building knowledge essential for Nordic societies in the application.

In addition, an important aspect of Nordic added value would be to generate knowledge about the consequences of the implementation of the EU AI act in the Nordics.

The EU AI act will come into full effect during the course of the initiative, preliminarily during the first half of 2026. There are considerable unknowns about which effects the legislation will have in general and on the Nordic countries in particular. The NordForsk administration therefore proposes that the call includes the effects of the new legislation and its implementation.

Data bias in relation to gender and equality

The availability of high-quality big data is a prerequisite for well-functioning AI. Built in bias in data is therefore reproduced by AI leading to issues of representation and discrimination. Bias should be addressed in the call when relevant.

Crosscutting strategic priorities

- Encouraging future capacity building in the area of AI through including early career researchers in key roles in proposals
- Requiring partners from four countries to create conditions for ambitious, stronger and broader multi-lateral research consortia with access to more data sources, wider surfaces for collaboration and net-works and with significant potential for impact
- Expecting cross-disciplinary research teams
- Including stakeholders and users in the research projects

The initiative could also include public and private sectors and public-private partnerships (PPPs).

Two stage application and review process

The first stage would consist of a short research proposal outline and the novelty of the application would be addressed in the first review stage together with an assessment of Nordic added value, the cross-disciplinary nature of the proposal, stakeholder involvement, and inclusion of early career researchers. This stage would consist of an eligibility check by the NordForsk administration and an assessment by an expert committee. A selection of the proposals would be invited to submit a full application that would be reviewed according to NordForsk regular procedure by an expert committee as well as a call committee. The call committee has the mandate to make strategic priorities to ensure a balanced portfolio.

Scenario 2: Thematic call(s) on the consequences and potential of AI in the Nordic societies

In light of the rapid development and implementation of AI technologies there are some shared areas of interest that are of critical societal significance for the Nordic countries and the Nordics as a region. It is therefore important to acquire knowledge to be able monitor and follow the developments and identify the range of consequences in these areas of particular interest. Consequences are and will be of a positive and negative nature and it will be important to have knowledge across the whole range. For example, research and innovation can be used to identify, amplify and fully capitalise on Nordic strengths and provide grounds for transfer of knowledge and lessons learned between sectors. At the same time, knowledge will be needed to mitigate risks, threats and negative consequences that are pronounced in the Nordics or threaten Nordic values and societal structures. With increased knowledge compensatory measures can be effectively developed and deployed to mitigate the effects of various risks. In short, a Nordic initiative on research and innovation can be used in the navigation of the digital transition of the economies to facilitate adaptation and stimulate resilience, using digitalisation as an advantage and human resources where they are most needed.

With a thematically focused call themes can be tailored and described with national priorities in mind, creating possibilities to pool funds from various government budgetary sources and thereby perhaps enabling more funding to be allocated to the initiative. Themes can be developed that are important for Nordic collaboration (and of particular Nordic added value) and that are complementary to national and EU efforts. With a clear anchoring in national and Nordic priorities there would be a clearer avenue to communicate results to policy and practice.

As mentioned under Scenario 1, the NordForsk administration has identified three preliminary areas of special Nordic interest based on shared values, social structures and societal challenges in the course of the work with this discussion paper. The areas of particular interest are the Nordic societal model, Nordic languages and culture, and environmental sustainability including climate change and biodiversity. As the areas to a large extent are intertwined, themes and topics are listed below in no particular order of importance.

- The Nordic region is characterised by strong democracies, high levels of trust and robust social cohesion. AI generated content is and will be used to spread misinformation and fake content that is damaging for the social fabric, undermines societal security and drives polarisation.
- Artificial intelligence has already had an impact on working life and labour markets and long-term consequences are difficult to foresee. AI will most probably continue to replace administrative tasks and generate qualified and creative content leading to job losses. However, as in previous transformations of the economy other sectors and jobs will emerge and grow and productivity can increase exponentially. Life-long learning and digital literacy will probably only grow in importance.
- The Nordic countries have high welfare ambitions and world class health care systems. AI can be used to decrease manual administration, increase effectivity, efficacy and accuracy, and tailor bespoke interventions. AI could relieve welfare systems under pressure from ageing populations, workforce shortages and increasing expectations from populations.
- The use of AI tools in teaching and learning is already widespread and it is important to generate knowledge about the effects on learning outcomes as well as on skills, creativity and critical thinking among different groups of students.
- Artificial intelligence can be deployed to support sustainability efforts, for example enhancing manufacturing efficiency, supporting the transition to sustainable energy sources and materials, and aiding the shift to sustainable agriculture. AI can also be used for monitoring purposes, surveying biodiversity and climate change. The environmental impact and sustainability of AI technologies is also an important aspect.
- Structural changes to the economy do not have an equal impact on the population, with winners and losers emerging relatively early on. A focus on inclusion and groups at risk is a central principle of the Nordic societal model and is important to counteract further polarisation.
- Large Language Models (LLM) are a prerequisite for high quality generative AI. Generative AI tools developed based on non-Nordic languages and trained on non-Nordic content might not be linguistically or culturally appropriate in a Nordic context. Similarities between Nordic languages and cultures can contribute to more relevant language models for Nordic and national conditions and there are several unique data repositories in the Nordics that potentially could be combined for this purpose.

The actions to focus the call, ensuring relevance and value for money outlined under scenario 1 are also appropriate to consider under scenario 2. Regarding the modality of the call, in terms of application and review processes, the NordForsk administration recommends that processes should be tailored to choices regarding the ambition and breadth of calls.

Conclusion

The scenarios presented here, including themes and Nordic added value, are a preliminary suggestion from the NordForsk administration. A working group consisting of representatives from interested funders could do further work identifying and developing a successful model for a joint call. An advantage with Scenario 1 could be that it would be easier to communicate as an ambitious initiative focusing on AI and it could open for perhaps more creative and novel approaches. Scenario 1 could also to a large degree build on existing Nordic strengths among the research and innovation communities, creating and strengthening capacity and competencies. Adopting Scenario 2 could on the other hand fund research and innovation in areas with common Nordic challenges with clear added value and policy relevance. Scenario 2 could potentially require some more time and resources to delineate but would also be administratively less burdensome and easier to execute.

NordForsk recommends focusing on identifying instruments and thematic scoping with the broadest possible support and ambition among the funders within the timeframe indicated in this discussion paper in the chapter below.

Recommendations – A multi-tool initiative

The NordForsk administration would like to recommend to NORDHORCS to establish a Nordic initiative for research and innovation on responsible and ethical use of Artificial Intelligence. The initiative could have multi-tool approach, with activities such as calls, workshops, working groups addressing different needs and purposes on various levels. A working title for the initiative is NAIC- Nordic Artificial Intelligence Collaboration.

NAIC - Nordic Artificial Intelligence Collaboration

The NordForsk administration is prepared to allocate personnel resources to coordinate a Nordic multi-tool initiative on AI including a variety of activities, such as:

- Developing and executing Nordic research and innovation calls on AI
- Coordinating activities such as committee and workshops
- Following the policy development in the field
- Engage with other relevant groups of stakeholders
- Keeping up to date with developments in EU and other relevant actors
- Closely following the research and innovation activities funded by the initiative and work with dissemination of results to policy and practice

The NordForsk administration proposes to establish a preparatory NAIC working group consisting of interested funders with the mandate to develop and flesh out the activities and tools that an initiative would consist of. The working group would collaborate to submit an expression of interest for a call, with a funder taking a leading role, to the NordForsk board in September 2024.

After the board meeting, a NAIC committee would be constituted for the initiative, replacing the working group. The committee would consist of representatives from the funders that have committed resources to the initiative, coordinated by the NordForsk administration. The chair ship of the committee would operate on a rotational basis among the representatives of the funders.

The committee would be responsible for developing the initiative in a timely manner and giving added value in relation national and EU funding. Activities that the committee could be involved in include:

- hosting roundtable discussions with experts providing insight into the field, anchoring the initiative and making sure that it is relevant and up to date
- consider the scope of the initiative in relation to AI and the more general concept of digitalisation
- monitoring developments in national and EU funding and bringing forwards suggestions for the Nordic initiative

Calls

The committee could use the scenarios outlined in this paper as a starting point for discussion for developing calls. It would be feasible to open a call during quarter 1, 2025. Calls could be open, with a degree of focus, or with a more thematic scope. The committee should also take into consideration the following:

- Funding model of calls, true common pot/virtual common pot or a hybrid model (with true common pot for the Nordic countries and virtual common pot for extra-Nordic countries)
- Developing thematic focus and Nordic added value
- Funding instruments
- Financial framework and activities eligible for funding
- Extra-Nordic countries to invite, such as the Baltic states
- Application and review processes

NordForsk has a broad palate of funding instruments that the committee can use and develop for its purposes. Examples include research projects (commonly with a lifetime of between 3 and 5 years), research networks, centres of excellence, university hubs and preparatory projects to build Nordic consortia targeting EU calls.

The NordForsk administration believes that there are sound arguments for funding joint primary research activities in this area. Considering that AI has relevance for and impact on all sectors of society and is rapidly evolving in unpredictable ways, capacity building is central for developing sound and informed responses and governance structures. An added value of Nordic initiatives is that they can be fast and flexible and address national and Nordic common priorities and needs, compared to EU processes with a higher degree of negotiation, taxing administration and longer timeframes. Added value in relation to national funding is for example building critical mass and expertise, enhancing scientific quality and building on particular strengths of Nordic researchers. The most commonly used instrument for this purpose at NordForsk is research projects.

The idea of Nordic AI knowledge hubs has been raised in several context within the Nordic council of ministers and the Nordic council. The need for capacity building and knowledge sharing can be facilitated through establishing a Nordic institution or through networks establishing a virtual hub. To a varying degree, national AI centres exist or are under development in the Nordic countries, such as AI Sweden and FCAI in Finland. The NordForsk administration believes that Nordic research funding could be well spent on connecting national expertise for joint research and innovation activities. Relevant expertise includes research, innovation, developers, law, and users. In this context, the NordForsk administration recommends network funding as it is flexible and cost-efficient instrument. A funding model securing relevant and committed partnering institutions could consist of 1/3 of funding from NordForsk, 1/3 of funding from institutions (including in-kind) and 1/3 from the national research and innovation funders.

The EU AI act recommends the introduction of national or transnational safe "sandbox" testing environment for new AI solutions. In view of this the NordForsk administration would recommend the NIAC committee to consider the inclusion of researcher and innovator participation in sandboxes among the range of possible activities eligible for funding. Sandboxes create spaces for multi-disciplinary and multi-stakeholder cooperation in which innovative products or services that challenge existing legal frameworks can be tested. Sandboxes can bring up unexplored cross-disciplinary questions that merit attention from academia and facilitate societal responses. For example, how design and implementation impact utility and trust and the legal analysis of applicability of various tools (Moltzau 2024).

Competence building and knowledge sharing between funders

The use of artificial intelligence (AI) in research is becoming increasingly common. AI tools can boost efficiency but is not without ethical and legal implications. Funders must find ways to navigate in this new landscape which is under constant development, both concerning research proposal assessment and research funding processes. The European Code of Conduct for Research Integrity for example refers to "Hiding the use of AI or automated tools in the creation of content or drafting of publications" as unacceptable practice (Allea 2023, p.10).

Science Europe recently conducted a survey on the use of AI technology in member organisations. Respondents answered questions concerning the use of AI tools in research activities or processes, institutional guidelines to the use of AI tools and implementation of such guidelines. The survey indicates the importance of mapping practices and sharing knowledge and experience across organisations and national borders. When the NordForsk administration asked colleagues in national research councils in the Nordic region about their preferences for a potential Nordic research collaboration on AI, many raised the potential added value of sharing information on the use of AI in research and research funding.

NordForsk could be a platform for national research funding organisations in the Nordic region to share knowledge, practice, and experiences on AI and responsible research funding procedures. A Nordic network or working group could be beneficial for the national research councils for building capacity and when preparing to or following up on discussions in Science Europe. For NordForsk, it would be a way of keeping up to date on the development in national research councils and which consequences new guidelines could have for joint Nordic calls under NordForsk.

Based on the considerable interest from both Nordic and Baltic research funders the NordForsk administration proposes to invite to a workshop series on AI and research and innovation funding processes. The NordForsk workshop series will be coordinated in relation to eventual further work from Science Europe on this topic. If a need for strengthened and closer Nordic collaboration in this area is identified, NordForsk could contribute to for example working groups.

Sequencing of activities and tools and overview

The NordForsk administration proposes that a multi-tool initiative would be beneficial for Nordic collaboration on the ethical and responsible use of AI. The specific activities are however not necessarily dependent on each other and can be developed and carried out in parallel or in sequel processes.

As outlined in this discussion paper, the initiative should have significant Nordic added value to the research and innovation communities, Nordic research and innovation funders as well as the Nordic societies in general. The committee's choice of tools and the sequencing of their deployment can secure informed priorities between areas and stakeholders, ensuring impact and Nordic added value. NordForsk suggests that the initiative starts with the following activities:

- Launching a call for primary research
- Consider a call for networks and capacity building
- Organising a series of workshops for funders

NordForsk suggests that these activities are followed up with:

- Evaluation of a need for new calls including use of new instruments
- Considering possible preparatory activities in view of upcoming EU calls and partnerships
- Organising activities with the funded projects

The following table illustrates how a time plan for a multi-tool initiative over a period of 4 years can be outlined. It can serve as a starting point for discussions in NORDHORCS.

Activities	2024	2025	2026	2027
NAIC committee.	Roundtable discussion in Q3. Working group submit EoI September. NAIC committee established autumn.	Following the policy development in the field. Keeping up to date with developments in EU and other relevant actors. Communicating initiative and calls.	Following the policy development in the field. Keeping up to date with developments in EU and other relevant actors. Following the research and innovation activities funded by the initiative and work with dissemination of results to policy and practice.	Following the policy development in the field. Keeping up to date with developments in EU and other relevant actors. Following the research and innovation activities funded by the initiative and work with dissemination of results to policy and practice.
Calls.	Preparatory work, Q3 and Q4.	Research project grants call open Q1.	Consider new calls and instruments: Network grant, EU preparatory grants, Data sharing and infrastructure collaboration.	Consider new calls and instruments: Network grant, EU preparatory grants, Data sharing and infrastructure collaboration.
Competence building and knowledge sharing between funders.	NAIC committee planning and initial workshop autumn.	2 workshops.	2 workshops Working group with key staff?	2 workshops Working group with key staff?

References and literature

Background

OECD 2019, <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>

The AI Safety Summit 2023, [AI Safety Summit | AISS 2023](#)

The European Commission 2019, [Ethics guidelines for trustworthy AI | Shaping Europe's digital future \(europa.eu\)](#)

The European Parliament 2023, <https://www.europarl.europa.eu/topics/en/article/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence>

The White House, October 2023, [FACT SHEET: President Biden Issues Executive Order on Safe, Secure, and Trustworthy Artificial Intelligence | The White House](#)

World Economic Forum 2023, [The Future of Jobs Report 2023 | World Economic Forum \(weforum.org\)](#)

The EU AI Act

The UN, 2023 – UN AI Advisory Body – Interim Report, Governing AI for Humanity, Dec. 2023.

The European Commission 2019, Communication paper: "Building Trust in Human-Centric Artificial Intelligence" (Com(2019)168 final)

EU AI Strategies and proposals for AI Act

2018 - EU AI Strategy to 2027: Artificial Intelligence for Europe, 25.4.2018 COM(2018) 237

2019 - Independent High Level Expert Group on Artificial Intelligence: Ethics Guidelines for Trustworthy AI, 8. April.

2020 - White Paper on Artificial Intelligence – A European approach to Excellence and Trust, 19. 2. 2020 (Com(2020) 65)

2021 - Coordinated Plan on Artificial Intelligence, 21.4.2021 COM(2021) 205

2021 - Proposal for Regulation of the European Parliament and of the Council, laying down harmonized rules on Artificial intelligence (Artificial Intelligence ACT) and amending certain Union legislative ACTS. 21.4.2021 (COM(2021) 206)

2023 - REPORT on the proposal for a regulation of the European Parliament and of the Council on laying down harmonized rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain Union Legislative Acts, 22.5.23 COM(2021) 020

Nordic Council of Ministers and Nordic Council priorities and activities

NCM 2023 - A Nordic approach to democratic debate in the age of Big Tech: Recommendations from the Nordic Think Tank for Tech and Democracy <https://urn.kb.se/resolve?urn=urn:nbn:se:norden.org:diva-12818>

NCM 2018 - AI in the Nordic-Baltic region – Nordic Council of Ministers for Digitalisation declaration [AI in the Nordic-Baltic region | Nordic cooperation \(norden.org\)](#)

NCM 2022 - Digitalization at the courts "[Digitalization at the courts" \(norden.org\)](#)

NCM 2023 - Handbook of cross-border data exchange within the Nordic and Baltic countries: Lessons learned in cross-border data exchange in the fields of studying and using healthservices in another Nordic and Baltic country, and in the use of Nordic and Baltic legal databases <https://urn.kb.se/resolve?urn=urn:nbn:se:norden.org:diva-12994>

Nordic Innovation 2021 - Data Sharing for a Circular Economy in the Nordics: Baseline Mapping 2021 <https://urn.kb.se/resolve?urn=urn:nbn:se:norden.org:diva-12275>

National Nordic AI Strategies and funders reports on AI:

2017 - Finland: Finland's Age of Artificial Intelligence, Turning Finland into a leading country in the application of Artificial Intelligence. Objective and recommendations for measures. Ministry of Economic Affairs and Employment, 4/2017.

2018 - Finland: Work in the age of artificial intelligence - Four perspectives on the economy, employment, skills and ethics 21/2018

2019 - Finland: Leading the way into the age of artificial intelligence, Final report of Finland's Artificial Programme 2019. 41/2019

2018 - Sweden: Artificial Intelligence in Swedish Business and Society. Analysis of Development and Potential. Final report. Fef.no 2017-05616.

2018 - Sweden: Artificial intelligence in Swedish Business and Society, Analysis of Development and Potential. Summary. May 2018.

2018 - Sweden: National approach to Artificial Intelligence

2020 - Sweden: FORMAS & Vinnova: AI in the service of climate.

2019 - Denmark: National Strategy for Artificial Intelligence, March 2019

2019 - Denmark An AI Nation? Harnessing the opportunity of artificial intelligence in Denmark? McKinsey & Company & Innovation Fund Denmark. September 2019

2020 - Norway: National Strategy for Artificial Intelligence

2021 - Iceland: Icelandic Policy on AI (Not published in English)

EU programmes and initiatives

2020 – EU JRC Conference and Workshop Report – AI Watch, Artificial Intelligence for the public sector. Report of the "1.st Peer Learning Workshop on the use and impact of AI in public services", Brussels 11-12 February 2020. ISBN 978-92-76-19438-5

2021 - Partnership Fiche: Artificial Intelligence, Data and Robotics. https://projects.research-and-innovation.ec.europa.eu/sites/default/files/bmr-2022/ec_rtd_bmr-2022-ai-data-and-robotics-fiche.pdf

2022 - AI Watch - European Landscape on the Use of Artificial Intelligence by the Public Sector.

2022 - Performance of European Partnerships: Biennial Monitoring Report 2022 on partnerships in Horizon Europe. file:///C:/Users/Jens/Downloads/performance%20of%20european%20partnerships-KI0521240ENN.pdf

2023 - Horizon Europe, Work Programme 2023-2024, Digital, Industry and Space, C(2023) 2178, 31. March 2023 https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-7-digital-industry-and-space_horizon-2023-2024_en.pdf

2023 - Horizon Europe, 7. Work Programme 2023-2024, Digital, Industry and Space. European Commission decision C(2023) 2178 of 31 March 2023

Two scenarios for Nordic research and innovation collaboration

OECD 2023, The state of implementation of the OECD AI principles four years on

Recommendations – A multi-tool initiative

Allea 2023, <https://allea.org/wp-content/uploads/2023/06/European-Code-of-Conduct-Revised-Edition-2023.pdf>

Alex Moltzau and Robindra Prabhu 2024, Castles in the sand? How public sector and academia and partner in sandboxes to leverage generative AI for public good

Annexes

Annex 1: Examples of some concerns and implications of AI on society

Ethical Concerns:

- **Bias and Discrimination:** AI systems can inherit biases present in their training data, leading to discriminatory outcomes in areas like hiring, law enforcement, and loan approvals.
- **Privacy:** AI's ability to analyse vast amounts of personal data raises privacy issues. The potential for surveillance and data misuse is a major concern.
- **Accountability:** Determining who is responsible for decisions made by AI systems, especially when they go wrong, is challenging.

Social Implications:

- **Job Displacement:** Automation driven by AI could lead to significant job losses in certain sectors, raising concerns about employment and income inequality.
- **Human Dependency:** Over-reliance on AI could impact human skills and decision-making abilities.
- **Social Manipulation:** AI-powered systems like deepfakes and targeted advertising can be used for misinformation and manipulation.

Economic Impact:

- **Market Concentration:** The high cost of developing effective AI systems could lead to market dominance by a few powerful entities, reducing competition.
- **Global Inequality:** Countries with more advanced AI capabilities may gain disproportionate economic and political power, exacerbating global inequalities.

Security Risks:

- **Vulnerability to Attacks:** AI systems can be targets for cyberattacks, which can be more complex due to the interconnectedness and automated nature of these systems.
- **Weaponization:** The potential militarization of AI raises concerns about autonomous weapons and new forms of warfare.

Regulatory and Legal Challenges:

- **Lack of Oversight:** The rapidly evolving nature of AI makes it difficult for regulations to keep pace, leading to potential gaps in oversight.
- **International Standards:** The absence of globally accepted standards for AI development and use can lead to ethical and legal discrepancies across borders.

Technological Uncertainties:

- **Unpredictability:** AI systems, particularly those based on machine learning, can sometimes behave in unpredictable or unintended ways.
- **Explainability (or interpretability):** Many AI models lack transparency in how they reach conclusions, making it difficult to understand and trust their decisions.

Annex 2: National AI Strategies in the Nordic Countries

Finland (2017 updated 2019)

In October 2017, the Finnish Ministry of Economic Affairs and Employment published its national AI strategy entitled Finland's age of artificial intelligence (Finland, 2017). This report fits under the umbrella of a broader Artificial Intelligence Programme in Finland (also labelled as AI Finland) with a view to establishing AI and robotics as the cornerstones of success for Finnish companies. In 2018 the national AI strategy was complemented with a policy report on Work in the age of artificial intelligence (Finland, 2018). It is a thematic report that reflects on the impact of AI on labour market dynamics and skills requirements.

The strategy highlights Finland's possibilities in the global market along with its strengths and weaknesses in AI. It describes how AI will transform society and provides a range of policy actions and recommendations for Finland to thrive in the age of AI. The goal was to position Finland as a leading country in AI. Finland has thereafter adopted an open data policy and aimed to create adequate conditions for a prosperous development of AI. Overall, the strategy strived to:

- Increase the competitiveness of business and industry.
- Dedicated new AI powered education and vocational education and training.
- Mobility between education programmes and participation in third-level studies.
- Lifelong learning system should be reformed "dramatically" integrating AI skills.
- Support labour mobility.
- Research programmes for developing and applying AI technologies.
- Provide high-quality public services and improve the efficiency of the public sector.
- Ensure a well-functioning society and wellbeing for its citizens.
- More funding for research and innovation and innovation policy. 4% of GDP by 2030 should be the target.

In 2019 the Finnish Ministry of Economic Affairs released the final report of Finland's Artificial Intelligence Programme, entitled Leading the way into the age of artificial intelligence (Finland, 2019). On pages 80-82 of this report, the Finnish Government provides investment figures for several flagship policies. For instance, the AI Business Programme has been allocated EUR 100 million over a four-year period. The Finnish Centre for Artificial Intelligence (FCAI) was granted EUR 8.3 million in flagship funding for 2019–2022.

In November 2020, Finland has launched an updated AI strategy: the Artificial Intelligence 4.0 Programme promotes the development and introduction of AI and other digital technologies in companies, with a special focus on SMEs from several industrial and service sectors.

Focus on AI in the public sector:

- AI-powered public services are crucial for the Finnish economy and welfare
- AuroraAI is the key action to change public services with AI with a life-events approach together with private sector partners
- Capacity of civil servants to work with AI needs to be strengthened
- Definition of strong ethical considerations for using AI in public services
- Creation of a sandbox to test AI solutions for the public interest

Sweden (2018)

In May 2018, the Swedish Government released its national AI strategy National approach for artificial intelligence (Sweden, 2018). This strategy points out the general direction for AI in Sweden in order to create a basis for future policy actions and priorities. In this sense, this strategy serves as a reference for the government to outline forthcoming policy initiatives with the aim to strengthen Sweden's welfare and competitiveness by means of AI. To this purpose, the Swedish strategy focuses on the following priority areas:

- Education and training.
- Research.
- Innovation and use.
- Framework and infrastructure.

Prior to the release of the strategy, Vinnova – Sweden’s innovation agency – published an extensive policy report outlining the opportunities and challenges of AI in Sweden, and Sweden’s capabilities to embrace the full potential of AI (with concrete examples of ongoing AI projects). This section presents the policy recommendations of Sweden’s AI strategy. Where possible, it aims to incorporate new policy initiatives that have been rolled out since the launch of the strategy in May 2018. In terms of funding, Vinnova funded AI projects for SEK 675 million (approx. EUR 67.5 million) in 2020. The total sum for AI projects that Vinnova helped fund was SEK 1,350 billion (approx. EUR 135 million), 50% of this could be private founding or funding from other national programs. In the national budget for innovation and research until 2024 at least SEK 550 million (approx. EUR 55 million) has been assigned to research and innovation in digital technologies and AI and its use and impact on society.

Focus on AI in the public sector:

- AI must be used to make a more effective and relevant public sector.
- Active promote AI applications in public sector activities by making relevant data available.
- Public and private sector should cooperate to develop and manage together AI.
- Sweden needs pilot projects, testbeds and environments for development of AI applications in the public and private sectors.
- Use public sector data to train AI tools which could be used to develop new or improve existing public sector services.

Denmark (2019)

In March 2019, the Danish Government published its National AI strategy (Denmark, 2019). The Danish strategy sets out the goals and visions for AI development in Denmark, it presents the challenges to be addressed and it identifies specific policy initiatives and priority areas. It aims at putting Denmark at the forefront of responsible development of AI and sets out four objectives to achieve this goal:

- Develop a common ethical and human-centered basis for AI.
- Prioritize and support research and development of AI. I.e. both basic and applied research should be funded.
- Encourage the growth of Danish businesses by developing and using AI.
- Ensure that the public sector uses AI to offer world-class services for the benefit of citizens and society.
- Denmark should cooperate closely with other Nordic and European Countries on having a responsible use of AI.
- More public data in the cloud for AI for public authorities and research.
- More education and vocational training in AI.

The strategy originally contained 24 initiatives for which EUR 9.2 million has been reserved by the Danish Government for the period 2019-2027. The budget has since been reprioritized and lowered to EUR 5 million. The government plans to evaluate the strategy to determine future actions regarding AI. In addition, the 2019 national budget earmarked EUR 39.5 million for research in new digital technologies. An additional EUR 26.8 million has been earmarked for an Investment Fund (2019-2022) to help municipal and regional government authorities develop and adopt digital welfare solutions and new technologies.

Technological possibilities, such as AI, also play a role in the research funding established via the 2020 budget.

The outlined policy initiatives below also include those presented in the Strategy for Denmark's digital growth (Denmark, 2018), a policy report setting the direction for how Denmark can seize the opportunities of the digital transformation. The report contains 38 initiatives, some of which relate directly to AI or provide initial policy steps that will push the development of AI technologies.

Focus on AI in the public sector:

- Public sector should use AI to offer world class services to citizens
- Create a responsible ethical and legal framework for use of AI in the public sector
- Improving data quality and quantity for AI
- Enhance the competencies on AI in the central government
- Allocation of funding to test and deploy new technologies
- Sharing of experiences of AI initiatives
- Signature projects in the public sector
- More Open Public-Sector data for AI.

Norway

The Norwegian Government presented its National AI strategy in January 2020 (Norway, 2020a). The objective of the strategy is to outline the policy actions for the coming years in order to maximize the opportunities that AI can bring along for Norwegian individuals, for businesses and industry, and for the public sector. To achieve this outcome, the national AI strategy highlights the following policy initiatives:

Expanding the offer of education programmes and workplace training in the field of AI to create a solid basis of digital skills and capabilities.

- Norway will lead the way to developing and using AI with respect for individual rights and freedoms. In Norway, AI will be based on ethical principles, respect for privacy and data protection and good cyber security.
- Strengthening the Norwegian research in AI (NORA, BigInsight, Industrial PhD etc.)
- Enhancing the innovation capacity in AI in both the private and public sector.
- Outlining ethical principles for AI to allow fair, reliable, and trustworthy AI-related developments.
- Establishing digitalization-friendly regulations to define the legislative framework in which AI developments take place.
- Constructing a strong data infrastructure ensuring open data and data sharing across sectors and business areas. Data lakes, data trust, synthetic data, anonymization interface, common open application programming interfaces are some of the methods for storing and sharing data, mentioned in the strategy.
- Dedicated opportunities for language data resources are established through The Norwegian language bank at the National library.
- Deploying a telecommunication infrastructure that provides high-capacity connectivity and computing power, and that ensures security in AI-based systems as introduced in 2019 for the financial sector in Norway.
- Establishing regulatory sandboxes legislative amendments and to test specific parameters for new AI applications.
- Strong engagement in the EU programmes for Digital Europe and in Horizon Europe programmes where AI solutions are supported.
- Engage in Nordic cooperation through initiatives the Nordic Council of Ministers. Nordic cooperation is important, because we share the same interest and values with respect to AI.

While the national AI strategy mentions various provisions to finance specific projects, it does not provide the total amount of funding for the implementation of the strategy.

Focus on AI in the public sector:

- Strategy aims to support value creation and use of AI in the public sector
- Facilitate the sharing of public sector data among public sector agencies through a national resource centre for data sharing.
- Legal barriers to public sector AI will be reviewed and updated, in particular issues regarding data protection and statutory authority
- All AI used in the government have to be transparent and explainable
- Guidelines will be made available to help public administrations overcome uncertainties
- Public procurement can be an instrument to adopt AI in Norwegian public administrations. Innovation partnerships and innovative procurement may be good tools for this.

Main topics in the European National Strategies when addressing the needs and services of the public sector (National, Regional and Local Administration) according to an AI Watch 2022 study

	Topic	Description	Main policy initiative
1	Stimulating awareness	Initiatives that focus on stimulating awareness among civil servants on AI and on fostering mutual-learning initiatives for facilitating knowledge and experience transfer among public servants.	- Awareness campaigns - Building an international community
2	Improving data access and quality	Initiatives that aim at improving the data quality, availability and accessibility of the public sector to develop and implement AI.	- Improving data quality - Improving data access - Enhancing access to private sector data
3	Improving internal capacity (skills)	Initiatives related to the improvement of the qualified internal capacity in public administrations. This implies also the design of initiatives for increasing public servants' AI-related skills.	- Training on AI - New public bodies
4	Learning by doing: Pilots and experiments	Initiatives related to the promotion and development of AI flagship projects used to learn from AI implementations and their effects.	- Regulatory sandboxes - Pilot projects
5	Ethical and legal AI guidelines	Initiative related to the development of normative frameworks, to act as a guide for public sector AI usages, intended to reflect ethical considerations of using AI.	- Development of ethical frameworks - Reform on data sharing laws
6	Funding and procurement	Initiatives intended to stimulate the development and uptake of AI by providing adequate funding, for example through special funding programmes to provide financial resources for AI experiments and projects.	- Funding for AI projects - Stimulation of GovTech startups Revision of procurement processes

Annex 3: EU programmes and initiatives

Budgets for the 10 partnerships under Pillar II, Cluster 4, Digital, Industry and Space

Partnership name	Type of Partnership**	EU bn €	National bn €	Partners bn €
Key Digital Technologies JU incl. Quantum Technologies (KDT)*	Co-funded	€1,35	€1,6	€3,0
Smart Networks and Services (SNS JU)	Institutionalized	€0,9	-	€0,9
High Performance Computing (EuroHPC)	Institutionalized	€3,0	-	€0,9
European Metrology (Art. 185)	Institutionalized	€0,33	-	€0,33
Artificial Intelligence, Data and Robotics (ADR)	Co-programmed	€1,3	-	€1,3
Photonics – Photon Hub	Co-programmed	€0,34	-	€0,34
Made in Europe – Manufacturing	Co-programmed	€0,9	-	€0,9
Clean Steel - Low Carbon Steelmaking (CSP)	Co-programmed	€0,7	-	€1,0
Processes4Planets – Hubs for Circularity	Co-programmed	€1,3	-	€1,3
Globally Competitive Space Systems	Co-programmed	€0,15	-	€0,18

*KDT was in 2023 merged with the new Chips JU programme

**Co-funded partnerships are funded by EU, National funding Agencies and private partners, Institutionalized partnerships on EU Council regulation Art. 187 or EU Parliament and Council Art. 185. They are implemented by dedicated structures without bi-annual work-programmes. Co-programmed are public-private partnerships co-funded by EU and the mostly private partners.

TEF - Sandbox transnational Testing and Experimentation Facilities for AI algorithms. In the first phase from 2021-2023, 4 TEF "sandboxes" under the Digital Europe have been approved. TEFs are sandbox test-centres where AI services can be tested in closed and safe environments before being released. The 4 TEFs started 1. January 2023. Other TEFs are expected to be in the coming years. According to the funding conditions TEFs must offer their services to SME's, mid-caps, other organisations and researchers.

Total EU earmarked budget for TEFs: €220. EU funding per TEF €30-60 mio for a 5 years period.

There are Nordic participation in all 4 TEFs: DK in CITCoM.AI, AI-Matters, Finland in TEF-Health and Sweden in TEF-Health and Agri-Food.

TEFs will support AI developers to bring trustworthy AI to the market more efficiently, and facilitate its uptake in Europe. TEFs are specialised large-scale reference sites open to all technology providers across Europe to test and experiment at scale state-of-the art AI solutions, including both soft-and hardware products and services, e.g. robots, in real-world environments.

These large-scale reference testing and experimentation facilities will offer a combination of physical and virtual facilities, in which technology providers can get support to test their latest AI-based soft-/hardware technologies in real-world environments. This will include support for full integration, testing and experimentation of latest AI-based technologies to solve issues/improve solutions in a given application sector, including validation and demonstration.

TEFs can also contribute to the implementation of the Artificial Intelligence Act by supporting regulatory sandboxes in cooperation with competent national authorities for supervised testing and experimentation.

TEFs will be an important part of building the AI ecosystem of excellence and trust to support Europe's strategic leadership in AI. The 4 TEFs focus on Agri-Food: agrifoodTEF, Healthcare: TEF-Health, Manufacturing: AI-MATTERS, Smart Cities & Communities: Citcom.AI.

List of TEFs approved by 2023

Acronymes	Thematic domains	Coordinators	Nordic Partners	Other partners	EU budget
CitCom.ai	Testing of AI and robotics solutions targeting sustainable development of cities and communities. Smart cities. Focus is Power, Move, Connect.	DTU Compute, DK	Denmark: DI, We Build Denmark, Teknologisk Institut, Gate 21, CenterDenmark, Govtech Midtjylland. Sweden: RISE. Finland: Business Tampere.	36 partner from NL, Belgium, Luxembourg, France, Germany, Spain, Poland, Italy and the Nordics.	€40 mio.
TEF-Health	Testing of AI and robotics within health and care systems to ensure compliance with legal, ethical, quality and interoperability standards.	Charité, DE	Sweden: Rise, Karolinska Institutue. Finland: HUS, Metropolia, Helsinki City.	51 partners from Germany, France, Belgium, Portugal, Slovakia, Italy, Czechia and the Nordics.	€50 mio.
AgrifoodTEF	Testing of AI and robotics in 5 sectors: arabe farming (autonomous driving, tree crops, horticulture, livestock farming, food processing.	Foundation Bruno Kessler, IT	Sweden: Rise, AstraZero.	29 partners from Italy, Germany, France, Poland, NL, Belgium, Austria and Sweden.	€60 mio.
AI-MATTERS	Network of physical and digital facilities across Europe within manufacturing. Focus is to test and deploy the AI, robotics and smart autonomous systems.	CEA-List, FR	Denmark: DTI Robotics, Alexandra Inst. Force Technology, Odence Robotics.	25 partners from France, Germany, Greece, Italy, NL, Spain, the Czech Republic and Denmark.	€60 mio.

EDIH – National and regional European Digital Innovation Hubs or Competence Centres

EDIHs are national or regional competence centres with a focus on facilitating digital skills and knowledge. EDIH's are offering their services to SME's, mid-caps, other organizations and researchers. AI technology and knowledge is one of the key focus areas for most EDIHs. EDIH is co-funded by EU and national partners on a 50:50 basis. 161 EDIH has been accepted since 2021. 16 of the 26 Nordic EDIHs offer AI services. The Total EU funding budget €330, €1,5 to €3 per Hub.

List of Nordic EDIHs offering AI services

Country	Name	National or Regions	Topics	Participants
Denmark	AddSmart	Northern Denmark	Increase productivity of SME's through I4.0 in smart production	AAU, UC Northern DK, Tech College, Force Technology, Made Digital Lead, NorthDenmark EU office
Denmark	CD-EDIH	Central Denmark	To boost circular economy and SMART City's using Data analytics incl. AI.	AU, Force Technology, Alexandra Inst. Aarhus Municipality, MADE, CLEAN, Central Denmark Region EU office.
Denmark	EDOCobot	Funen & Southern Denmark	Supporting digital objectives for SME's to facilitate implementations of industrial Cobots in their production.	Erhvervshus Fyn, Teknologisk Institut, Odense Robotics, Organisation for EU and International Cooperation in Southern DK.
Denmark	GC EDIH	Greater Copenhagen	To support digital transformation in SMEs within AI and Computing continuum, within life science, health tech and built environment	KU, CBS, DTU, Force Technology, Alexandra Institut, Danish Life Science cluster, We Build Denmark, Erhvervshus Sjælland.
Denmark	SEDIH	Southern Jutland	Smart Energy Digital Innovation Hub. Digitalising of Energy Sector.	AU, SDU, AAU, DTU, Force Technology, Alexandra Institut, Digital Lead, Syddansk EU-kontor. Erhvervshus Sydjylland.
Finland	FAIR (Finnish AI Region)	Capital Region: Helsinki, Espoo, and Vantaa	Provides free or subsidized services to SME's to advance their AI, HP computing, cybersecurity Extended Reality etc. Focus on SME's within AI for smart cities, health or digital services.	Haaga-Helia Ammattikorkeakoulu, Esbo Stad City of Espoo, enter Espoo Oy, Metropolia, CoV, Helsingin Yliopisto, Aalto, CSC-IT center for Science, Kira-InnoHub ry, EIT Digital Finland
Finland	HHFIN (Health Hub Finland)	National	To support the development of AI, Big Data, Cybersecurity, digital solutions for health and wellbeing and to be a gateway to Finnish health and wellbeing data.	University of Oulu, University of Applied Services, Business Tampere, FINBB, Koupio Health, Oulu Business, Business Turku, VAR HA
Finland	Location Innovation Hub	National	Helps companies to harness the potential of location data, such as digital twins, precise positioning and next - generation location technologies	Finnish Geospatial Research Institute, Oulu University of Applied Science, Mtech Digital Solutions, LUKE, Finnish environment Institutes + 20 more
Finland	Robocoast	National	To supports SMEs and others to utilizing AI, Cybersecurity, HPC, data analytics, 5G and IoT, robotics and energy technologies.	University of Turku, Turku University of Applied Science, Tampere University, Åbo Akademi University, Lapland University, Oulu University, Novia University of Applied Sciences, Jyväskylän University, EIT Digital Finland, And many other organisations.

Iceland	EDIH-IS	National	AI, HPC computing, cybersecurity to advance digitalisation of public and private sector. One-stop-shop for export/import of digital expert knowhow.	University of Iceland, Reykjavik University HR, Rannis, Syndis, TM Software Origo ehf
Norway	OCEANOPOLIS	National	Accelerates the digital transformation of SMEs and the public sector for sustainable businesses, coastal regions and oceans. The digital accelerator works with "Test before Invest" in AI, Data, Robotics, IoT, Sensors, Artificial vision etc.	NORCE, Medic City Bergen AS, Nordic Edge AS, Innoventus Sør AS, Valide AS, VIS, Kunskapsparken Helgeland AS, KUPA, Mechtronics Innovation Lab
Norway	Nemonoor	National	AI, HPC computing, Cybersecurity, Advanced Digital Skills. Objective 1) to support SME/public sector with AI adoption, 2) synergies on European and national level	NTNU, University of Oslo, SINTEF, Smart Innovation Norway AS, Norway Health Tech, AKP AS, Institutt for Energiteknik.
Sweden	Aero EDIH	National	Will create societal and business impact by supporting the digital and green transformation of SMEs, regional airports and public sector within the domain of aerospace. Aero EDIH will act as multiplier within the fields of HPC, AI, cybersecurity and other advanced digital skill.	Linköping University, RISE, Independent Business Group Sweden AB, Advanced Air Mobility AAM AB
Sweden	DITALHUBS	Skåne, Blekinge, Kronberg	To increase and accelerate growth and productivity by digitalisation for SMEs in manufacturing industry, to catalyse and drive digital transformation in the public sector. Focus of IoT, AI, Cybersecurity and HPC.	Lunds University, LNU, malmö University, Malmö Std, Växjö Linnaeus Science Park AB, Campus Ljungby, RISE and more public and private partners
Sweden	HDS (Health Data Sweden)	National	To provide digital health care data to SMEs mid caps and research. Services within AI, big data, cybersecurity, digital twins and HPC will be offered.	Stockholms University, Uppsala University, Karolinska, LNU, EITD, several regions and science parks.
Sweden	ShiftLabs	National	One stop shops within digital technologies, as well as AI testbeds, data centres. Focus on support to SMEs within AI, Cybersecurity Industry 4.0 etc.	Malardalens University, KTH, Chalmers Tekniska Högskola AB, Högskolan i Skövde, RISE, EIT, Södertälje Science Park.

Other Digital Europe (2021-2027) initiatives – total EU budget €9,2 bn:

- Artificial Intelligence: €2,5 bn.
- High Performance Computing (HPC): €2,7 bn.
- Cyber Security: €2 bn.
- Digital transformation and interoperability: €1,3 bn.
- Advances Digital Skills: €0,7 bn.

Thematic programmes under Horizon Europe supporting AI R&I projects including Chips Joint Undertaking – Approved in September 2023

The Chips JU is the main implementer of the Chips for Europe Initiative. The Chips JU aims at strengthening Europe's semiconductor ecosystem and economic security by managing an expected budget of nearly €11 billion by 2030, provided by the EU and participating states. In Chips JU budgets for infrastructure from DG Digital and budgets for Research and Innovation from DG Research have been batched into one programme.

The Chips JU will:

- Set up pre-commercial, innovative pilot lines, providing industry state-of-the-art facilities to test, experiment and validate semiconductor technologies and system design concepts;
- Deploy a cloud-based Design Platform for design companies across the EU;
- Support the development of advanced technology and engineering capacities for quantum chips;
- Establish a network of competence centres and promote skills development.
- Fund earmarked budget for R&I projects within semi-conductors and microships.
- An open R&I budget for open R&I projects which will facilitate the introduction of new technology and concepts from the early design phase to the implementation in products.
- Open an EU funding mechanism for equity to SME's and start-up.

The work of the Chips JU reinforces Europe's technological leadership by facilitating the transfer of knowledge from the lab to the fab, bridging the gap between research, innovation and industrial activities, and by promoting the commercialization of innovative technologies by European industry including start-ups and SMEs.

The R&I activities in the illustration above, which budget-wise is not covered under the Chips for Europe Initiatives budget is the Key Digital Technologies programme (KDT). KDT started as a Horizon Europe programme in 2021 but has now become a part of the new Chips JU programme. The two R&I programs in Chips JU are public-private partnerships between national authorities, industry, and the European Commission for research and innovation. The objective is to have a strong and globally competitive electronics components and systems industries in Europe. It aims to reinforce Europe's potential to innovate through contribution of electronic components and systems, including microsystems, software technologies, sub-assemblies, and systems of systems giving secure and trusted technologies to strategic value chains.

AI technology is an integrated part of in most of the technologies addressed by the open R&I part of Chips JU. But to support an integrated use of AI, which today mostly runs in the cloud, new approaches such as edge computing, very small raspberry computers and embedded software and IoT solutions must be developed. This also include Edge AI Testing and Experimentation Facility to ensure the availability in Europe of trusted, high-performance, low-power edge components and technologies to support the massive data-processing requirements of AI and the digital transformation. The facility will enable companies to develop, test and experiment AI product prototypes based on advanced low-power computing technologies, custom-designed for their application environment.

European Research Council (ERC)

ERC has 4 bottom up programmes for researchers. The number of PhD degrees in topics that can be defined as artificial intelligence is also steadily growing. Moreover, methods from artificial intelligence are increasingly used as tools by PhD candidates and researchers in other areas. Open programmes as the ERC scholarships will hence increasingly be oriented towards AI related studies. EU's annual budget for ERC scholarships is approximately: €2,2 bio. The budget is shared by 4 EU programmes:

ERC Synergy grants (Grant for multiple Principal Investigators): Total budget for the programme: €400 mio. Max funding per grant €10 mio. for a period of 6 years. (+ extra €4 mio. if the applicants moves from a non-EU-country to EU 27 or associated country). The grant covers 100% of eligible costs + 25% in overhead.

Number of funded projects in 2022: 37 projects with a total budget of €395 mio. 135 researchers representing 114 universities and research centres in 19 countries received funding. Researchers in the Nordic countries received 13 grants. The projects are multi-disciplinary and includes researchers from several countries.

ERC Starting grant (Monobeneficiaries): For promising early-career researchers with 2 to 7 years experience after PhD. Funding up to €1,5 mio. For a period of up to 5 years. The grant covers 100% of eligible costs + 25% in overhead. Number of grants in 2023: 400 grants with a total budget of €628 mio. Success-rate: 14,8%. Thematic distribution: 117 Society and Humanity, 173 Physics and Engineering, 110 Life Science. Success rate: 14,8%. Researchers in the Nordic countries received 13 grants.

ERC Consolidator Grant (Monobeneficiaries): For excellent researchers with 7 to 12 years experience after PhD. Funding up to €2 mil. i 5 år. The grant covers 100% of eligible costs + 25% in overhead. Number of grants in 2023: 308 grants with a total budget of €627 mio. Success-rates 14,5% Thematic distribution: Social Science & Humanities 90, Physical Science & Engineering 129, Life Science 89

ERC Advanced Grants (Monobeneficiaries): For established research leaders with a recognized track record of research achievements: Two cut off dates in 2023. Funding up to €2,5 mio. over 5 år. The grant covers 100% of eligible costs + 25% in overhead. Number of grants in 2023: Expected 246 grants with a total budget of €597 mio. Expected success-rate 14%. The grants for the last 2023 call will be provided in Q1 2024.

Thematic distribution: Not known yet.

Distribution of Nordic ERC grants by programme and topic in 2023

Country	Type of grant	Synergy grants multidisciplinary	Starting grants	Consolidated grants	Advanced grants	Of which AI related
Denmark	Social science and hum.		4	4	2	1
Denmark	Physics and engineering		1	7	3	1
Denmark	Life science		0	3	2	0
Denmark	Total	2	5	14	7	2
Finland	Social science and hum.		5	1	1	0
Finland	Physics and engineering		3	2	2	0
Finland	Life scienc		3	2	1	0
Finland	Total	1	11	5	4	0
Iceland	Social science and hum.		1	0	0	0
Iceland	Physics and engineering		0	0	0	0
Iceland	Life science		0	0	0	0
Iceland	Total	0	1	0	0	0
Norway	Social science and hum.		4	2	0	0
Norway	Physics and engineering		2	0	1	0
Norway	Life science		2	2	1	0
Norway	Total	5	8	4	2	0
Sweden	Social science and hum.		4	3	6	0
Sweden	Physics and engineering		9	5	1	2
Sweden	Life science		5	6	6	0
Sweden	Total	5	18	14	13	2
Reference countries						
Israel	Social science and hum.		4	3	5	2
Israel	Physics and engineering		11	9	6	0
Israel	Life science		11	2	5	1
Israel	Total	6	26	14	16	3
NL	Social science and hum.		22	18	14	11
NL	Physics and engineering		25	10	6	2
NL	Life science		7	9	4	1
NL	Total	7	44	37	14	4



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