



Rialtas na hÉireann
Government of Ireland

AI: Here for Good

A National Artificial Intelligence Strategy for Ireland

Prepared by the Department of
Enterprise, Trade and Employment
gov.ie

Minister's Foreword

The world is changing. We are becoming greener, more sustainable, and more digital. These changes have been accelerated since the onset of the COVID-19 crisis. Overnight, businesses and workers had to adapt to a new reality, embracing new technologies and new ways of working. Digitisation is transforming our lives and our economy, and artificial intelligence (AI) will be at the forefront of this transformation. As we move into the early phases of a recovery, we must look ahead at the opportunities presented by AI and other technologies to build back to a society and economy that is stronger, fairer and more resilient.

AI is not a technology of the future, it is a technology of the present. Given its wide application to all sectors, and its high capacity for impact, growth and contribution to improving competitiveness, AI is one of the technologies with the greatest potential for transformation in all areas of productive activity. But not just that, AI also poses significant opportunities in addressing and overcoming pressing social challenges and creating new value and possibilities for everyone not just the economy. The National AI Strategy therefore sets out a high-level direction, so we are best able to harness AI as a positive force for transformation.

Underpinning our Strategy are three core principles to best embrace the opportunities of AI – adopting a human-centric approach to application of AI; staying open and adaptable to new innovations; and ensuring good governance to build trust and confidence for innovation to flourish, because ultimately if AI is to be truly inclusive and have a positive impact on all of us, we need to be clear on its role in our society and ensure that trust is the ultimate marker of success. With these guiding principles, it is our ambition to put Ireland at the frontier of a people-centred, ethical and responsible rollout of AI. This will further enhance Ireland's reputation as a place where it pays to invest in innovation. Through the ingenuity, invention, and imagination of our people and our businesses we can help to create a smarter, more prosperous country.

We can already see the many applications of AI in our daily lives, our workplaces and across the economy. Many Irish businesses are harnessing AI in a variety of ways; using it to improve productivity, gain a better understanding of customers, and offer better products. We want to support more businesses to benefit from AI and help businesses already using AI to achieve more sustainable growth through trustworthy AI. We will do this by building on Ireland's capabilities; its thriving community of indigenous supply chain SMEs and the presence of world-leading software and ICT industries.

AI and other technologies are central to nearly every aspect of our lives, so everyone should be able to contribute to the development of AI in Ireland and also benefit from it. We cannot afford to leave people behind because they do not have the skills to participate in this changing economy. For a fairer, more evenly distributed recovery, we must ensure that the skills and talent of our people keeps up with the technology. Education and training in Ireland must respond to the scale of the digital transformation and the evolution of skills needs. This will allow the continued creation of sustainable, high quality jobs for workers. Providing workers with the right skills will go hand-in-hand with ensuring the benefits of the recovery and the digital transition are felt across the economy and throughout society.

However, we will not forge ahead by ourselves. Working with our colleagues and partners across Europe and beyond, we will build a more prosperous Ireland within a prosperous Europe. This will help to create conditions conducive to a safe, responsible and ethical international environment for AI-enabled companies to operate in.

If we are to attain the economy and the society we would like – greener, more productive, and technologically responsive – we need to create the conditions for this to happen. The National AI Strategy will serve as a roadmap to an ethical, trustworthy and human-centric design, development, deployment and governance of AI to ensure Ireland can unleash the potential that AI can provide. This will ensure we not only recover from the pandemic, but prosper as a modern, dynamic and ambitious nation.



A handwritten signature in black ink, appearing to read 'Robert Troy' with a stylized flourish at the end.

Robert Troy T.D.

Minister of State for Trade Promotion,
Digital and Company Regulation
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Contents

Executive Summary	4
Introduction	13
Vision and Objectives	15
Strand 1: AI and Society	16
1.1 Introduction	16
1.2 AI for Societal Good and Sustainability	16
1.3 Engaging the Public on AI and Building Trust	18
Strand 2: A Governance Ecosystem That Promotes Trustworthy AI	20
2.1 Introduction	20
2.2 Potential Risks of AI	20
2.3 Legal Framework for Trustworthy AI	21
2.4 Ethics and International AI Governance	23
2.5 Standards and Certification for Trustworthy AI	25
Strand 3: Driving Adoption of AI in Irish Enterprise	27
3.1 Introduction	27
3.2 Readiness of Irish Enterprise to Adopt AI	28
3.3 Driving Adoption of AI by Irish Enterprises	31
3.4 AI Sectoral Opportunities	36
3.5 Opportunities for Enterprise Collaboration on AI	36
Strand 4: AI Serving the Public	38
4.1 Introduction	38
4.2 Enablers for AI in Public Services	38
4.3 A Coordinated Approach to AI Adoption by the Public Service	40
4.4 High Impact Sectors for AI in the Public Service	43
Strand 5: A Strong AI Innovation Ecosystem	47
5.1 Introduction	47
5.2 A Strong R&I Ecosystem for AI	48
5.3 Strengthening AI Ecosystem Collaboration	50
Strand 6: AI Education, Skills and Talent	53
6.1 Introduction	53
6.2 AI and the Future of Work	53
6.3 Building Digital Skills for AI as part of the Education Curriculum	54
6.4 Building AI Skills	55
6.5 Attracting and Retaining International AI Talent	57
6.6 Women's Participation in AI	57
Strand 7: A Supportive and Secure Infrastructure for AI	60
7.1 Introduction	60
7.2 Trustworthy Data Infrastructure and Governance for AI	61
7.3 Digital and Connectivity Infrastructure for AI	65
7.4 AI and Cybersecurity	65
Strand 8: Implementation of the Strategy	67
Glossary of Acronyms	69
List of Organisations Consulted	71

Executive Summary

Introduction

Artificial Intelligence (AI) refers to machine-based systems, with varying levels of autonomy, that can, for a given set of human-defined objectives, make predictions, recommendations or decisions using data.¹ Machine Learning, a subset of AI, is software which is able to learn from applicable datasets to self-improve, without being explicitly programmed by human programmers.

AI is part of a suite of digital technologies which will play a major role in shaping global competitiveness and productivity over the coming decades, granting early adopters significant societal, economic and strategic advantages. AI and other digital technologies are also transforming the world of work; in the words of one commentary “the future of AI is the future of work”.²

There are many assumptions and misunderstandings about AI and its short- and long-term impacts on the economy and society. Popular narratives, science fiction, and media hype tend to influence our thinking about AI but are often unrealistic and lacking in nuance. However, AI offers great opportunities to improve our socio-economic performance and productivity, as well as our environmental and social wellbeing.

AI is already changing how we learn, work and live: from how we pay for online shopping, to using the apps on our phones. That change will continue to shape our economy and society, as AI’s transformative, disruptive technologies are embraced by new sectors and future generations.

Ireland is well-placed to be at the forefront of that change. As a country we have invested heavily in developing IT talent, entrepreneurship and connectivity. We’re also home to many of the world’s largest ICT businesses.

As that transformation happens, computers will begin to complement or replace specific tasks otherwise performed by people. Now is the time to put safeguards in place to make sure that happens securely, and in a manner that is fair, transparent and builds public trust.

This strategy sets out how Ireland can be an international leader in using AI to benefit our economy and society, through a people-centred, ethical approach to its development, adoption and use.

In recognition of the wide-ranging effect AI will have on our lives, this Strategy considers AI from a number of perspectives. These are:

Building public trust in AI

Strand 1: AI and society

Strand 2: A governance ecosystem that promotes trustworthy AI

Leveraging AI for economic and societal benefit

Strand 3: Driving adoption of AI in Irish enterprise

Strand 4: AI serving the public

Enablers for AI

Strand 5: A strong AI innovation ecosystem

Strand 6: AI education, skills and talent

Strand 7: A supportive and secure infrastructure for AI

Strand 8: Implementing the Strategy

A theme that runs through the entire strategy is Government’s commitment to an ethical approach to AI and to the secure use of AI and other digital technologies.

Ultimately the ambition of this Strategy is to make sure that AI is here for good.

1. OECD Council Recommendation on Artificial Intelligence, OECD/Legal/0449, (adopted 22 May 2019).

2. MIT Task Force on the Work of the Future, 2020.



Strand 1: AI and Society

The more people who understand and trust in the potential of AI, the more who will embrace it. The Government recognises the need to have meaningful engagement with the public on the development, governance and use of AI.

Human rights and ethical principles are a key focus of this strategy. It is vital that we listen to people's views and embed AI in society in ways that respect and promote diversity, inclusion, equality and non-discrimination.

AI offers transformative potential for tackling many societal, environmental and economic challenges. However, for this to be successful, widespread societal buy-in is required. The Government intends to begin the process of engagement and building trust through the following actions:

Objective

Strong public trust in AI as a force for societal good in Ireland

Strategic Actions

- i. Appoint an AI Ambassador to champion AI as a positive force for the economy and society [DETE]
- ii. Open a conversation with children and young people about AI through Comhairle na nÓg the national structure for consultation with children and young people [DETE / DCEDIY]
- iii. Promote and expand courses which educate the general public about AI [DFHERIS]
- iv. Expand AI for Societal Good Challenge Funds [DFHERIS, SFI / DPER / relevant Departments]
- v. Include opportunities for AI in climate action as part of the development of future climate policies [DECC / DFHERIS, SFI / DETE / DoT]

Strand 2:

A Governance Ecosystem that Promotes Trustworthy AI

Ireland is committed to an AI approach which is responsible, ethical and trustworthy. That will require an agile and appropriate governance and regulatory environment across three key areas:

Legal Framework:

Various pieces of legislation already apply to the development and use of AI today, and much of Ireland's existing legal framework should be sufficient to provide for the smooth deployment of AI. However, some legal gaps may require additional regulation and work is ongoing across Government to examine and address legal gaps for AI.

At EU level development of a horizontal European regulatory framework for AI is underway. Ireland is playing an active part in shaping this work, to develop a framework that ensures the protection of fundamental rights, while fostering innovation and benefiting from the opportunities presented by AI.

Ethics:

AI must support the ethical values of society and protect human rights. To achieve this, the EU has developed Ethics Guidelines for Trustworthy AI. An ethical approach will be at the forefront of Government's work to drive AI adoption in the private and public sectors, and we will provide a range of tools to help in assessing the trustworthiness of AI systems.

Standards and Certification:

Compliance tools such as standards and certification will be used to underpin both legal and ethical obligations with respect to AI. This work will be led by the Top Team on Standards for AI, which was established in 2020 by the National Standards Authority of Ireland (NSAI) to develop a standards and assurance roadmap for AI.

Objective

An agile and appropriate governance and regulatory environment for AI

Strategic Actions

- i. Continue to play an active part in discussions at EU level to define a horizontal regulatory framework for AI [DETE]
- ii. Consider an appropriate mechanism for ensuring a coordinated approach by Irish regulators to Digital, including AI, as part of the forthcoming National Digital Strategy [DOT/ DETE / DECC / D/Justice/ DTCAGSM / DCEDIY]
- iii. Examine and promote ways to help businesses self-assess the trustworthiness of their AI systems, including through development of case studies and toolkits for SMEs [DETE/ EI, IDA / DFEHRIS]
- iv. Publish a Standards and Assurance Roadmap for AI. [DETE-NSAI].
- v. Investigate the potential and requirements of regulatory sandboxes for AI [DETE-NSAI / DETE- EI/IDA / DFEHRIS-SFI]
- vi. Join the Global Partnership on AI [DETE/ DFA]
- vii. Continue to advocate within multilateral fora for an ethical and human rights-based approach to AI [DFA/other Departments as appropriate].
- viii. Consider the implications of AI as part of a planned review of equality legislation [DCEDIY].

Strand 3:

Driving Adoption of AI in Irish Enterprise

AI is already an important productivity driver in a wide range of sectors, including technology, financial services, agriculture, engineering, healthcare and life sciences.

As we emerge from the pandemic, there is the opportunity to reap a productivity dividend from AI (as well as other digital technologies) in businesses of all sizes and in all sectors. This strategy aims to encourage and help those enterprises, large and small, to adopt and benefit from AI.

To achieve that aim, Government will partner with Industry to drive widespread adoption of AI across enterprise through a phased approach of awareness building, opportunities to experiment with and pilot AI applications, assistance with planning and capacity building for AI, and help for implementation of AI solutions. Government will also encourage strong

interaction between research and industry, as well as promoting collaboration and spillovers between SMEs and leading-edge technology MNEs.

An AI Innovation Hub will also be established, as part of Ireland's planned programme of European Digital Innovation Hubs, to act as a National First Stop for AI, providing expertise and guidance to enterprises on their AI adoption journey.

Government will also consider the technology and infrastructure requirements to underpin the widespread and secure adoption of AI by businesses.

Objective

Increased productivity through a step change in AI adoption by Irish enterprise

Strategic Actions

- i. Establish an Enterprise Digital Advisory Board to advise and work with Government to drive industry adoption of AI and other digital technologies including by:
 - a. Assessing the current spectrum of AI resources available to industry from Government to inform actions to maximise the potential of the existing infrastructure
 - b. Developing an AI programme for enterprise of targeted funding and advisory measures for AI adoption
 - c. Raising awareness among businesses of all sizes of the resources available to help with AI adoption
 - d. Developing a national AI cluster or platform to drive collaboration between MNCs and SMEs [All actions above for DETE, EI, IDA, LEOs, SFI]
- ii. Consider the best model for a data and AI infrastructure platform to accelerate the onboarding and adoption of AI in industry [DETE/IDA/EI/DPER-OGCIO]
- iii. Establish an AI Innovation Hub, as part of Ireland's planned programme of European Digital Innovation Hubs, to act as a National First Stop for AI, providing expertise and guidance to enterprises on their AI adoption journey. [DETE, EI, Digital Europe].

Strand 4:

AI Serving the Public

The public sector has already embedded AI into the provision of certain public services, and is also piloting AI applications in a range of areas including agriculture, revenue and health. This has made the delivery of those services more efficient and has provided useful analytic data that can be applied in the formation of future public policies. To achieve the full potential offered by AI requires a coordinated public service-wide, strategic approach to the implementation of AI, that is secure and ethical. The GovTech Delivery Board, which is being established to drive digital transition in the Public Service, will consider AI adoption by the Public Service as part of its work

This will be done in a manner that is responsible and ethical. Government will lead the way and drive growth in AI by purchasing and developing ethical and trustworthy AI applications, and by using public procurement policies to stimulate and encourage industry to provide AI based products and services to government. We want Ireland's public service to become a showcase of AI adoption and reference site for industry solutions. By doing so, this will help to build public trust in AI.

Objective

Better public service outcomes through a step change in AI adoption by the Irish public sector

Strategic Actions

- i. The GovTech Delivery Board will consider the adoption of AI by the Public Service, including:
 - a. What appropriate safeguards are needed to ensure a secure system for AI development and use in the public service
 - b. The approach to developing and promulgating principles for trustworthy AI which will apply to all AI developed for and used by the Public Service.
 - c. The development needs for AI talent in the Public Service.
 - d. Opportunities for public procurement of AI, using public purchasing power to drive innovation and growth in the development of ethical and trustworthy AI.
- ii. Promote an 'open' environment for accelerating and testing AI applications in the Public Service, e.g. Hackathons and Workshops [DPER].

Strand 5:

A strong AI Innovation Ecosystem

If we want AI to thrive, a strong and supportive ecosystem for AI innovation is essential. Our ambition therefore is to drive AI innovation through world class research and development.

Ireland already has strong industry-academic research credentials built around Science Foundation Ireland (SFI)-run programmes, and many of our academic researchers are internationally renowned for their excellence in AI. As part of this strategy, we want to build on that reputation, promoting strong links

between industry, research and academia, so that innovative researchers, enterprises and entrepreneurs that are involved in developing and using AI are connected to each other and to appropriate support systems.

Other important elements of the ecosystem include a supportive funding environment, opportunities to connect with international partners, and access to testbeds where AI applications can be experimented with and piloted in real world environments.

Objective

A strong Irish ecosystem for high-quality and responsible AI research and Innovation

Strategic Actions

- i. Conduct a mapping of the AI R&I ecosystem [DFHERIS-SFI]
- ii. Identify sectors of opportunity for establishing AI testbeds and experimentation facilities [DETE, EI, IDA & NSAI / DFHERIS, SFI, Enterprise AI Advisory Board].
- iii. Promote Irish participation in international AI R&I programmes and relevant EU funding calls [DFHERIS, SFI/ DETE]
- iv. Explore potential mechanisms for all-island cooperation on AI R&I in strategic sectors, for example through the Shared Island initiative [DFHERIS, SFI/ DoT]
- v. Promote Ireland as a centre for talent in AI R&I as part of Global Footprint 2025 [DFHERIS/ DETE/ DFA]

Strand 6:

AI Education, Skills and Talent

With one in three jobs in Ireland likely to be disrupted by the adoption of digital technologies, our workforce needs to be prepared for the impact of AI. Some of the disruption, however, is likely to be around changes to job roles and tasks, rather than actual job losses. While AI will lead to some displacement, as with other previous disruptive technological advances, it will also lead to the creation of new jobs and higher productivity and incomes. The policy challenge is to ensure that these gains are shared equitably.

The Government will prioritise policies that ensure workers can access opportunities to upskill or re-skill, so as to adapt to these changes. Crucially, other interventions, including in the labour market regulation and social protection spheres, will be needed in order to protect workers' interests and ensure that increasing use of AI does not serve to deepen inequalities.

Alongside this, Ireland needs to develop, attract and retain AI talent. In this strategy, Government has set out how our workforce and population will be prepared for driving and adopting AI, through the

provision of digital, technical and complementary skills at all education levels, from primary school upwards, and how we will make Ireland an attractive place for international AI talent. In recognition of the importance of cybersecurity, a suite of M.Sc. programmes has been developed to build future skills in this area. We will also take steps towards improving gender balance in AI-related careers, which tend to be well remunerated but male-dominated at present.

Objective

A workforce prepared for and adopting AI

Strategic Actions

- i. Deliver a review in 2021 of the skills implications of AI over the next 5 to 10 years, and the skills-related actions needed to realise the potential of AI [DETE, EGFSN]
- ii. Encourage Higher Education Institutions to take a coordinated approach to delivering AI education and training informed by the outcome of the EGFSN review [DFHERIS, HEA and HEIs]
- iii. Assist employers to expand workplace-focused AI upskilling and reskilling, including through apprenticeships, SOLAS programmes, Skillnet Ireland training programmes and enterprise partnership schemes [DFHERIS, Skillnet Ireland, HEA, & SOLAS / DETE, Enterprise AI Advisory Board]
- iv. Consider how AI can be incorporated into future policy for digital learning [D/Education]
- v. Review the criteria for employment permits for critical AI-related skills, having regard to the research and analysis of AI skills needs that is undertaken [DETE].
- v. Establish an expert group to develop an action plan to increase the participation of women in related careers [DETE / DFHERIS / D/Education / DCEDIY].

Strand 7:

A Supportive and Secure Infrastructure for AI

The building blocks for a healthy AI infrastructure include access to high-quality and trustworthy data; robust data governance and privacy frameworks; secure high-speed telecommunication networks; and sufficient computing power and storage capabilities.

Many of these components are already core strengths for Ireland, including a strong track record in open data, and a commitment to rigorous data protection standards. Government has put in place legislation to allow public bodies to share personal data, which will be overseen by the Data Governance Board. Broadband rollout and High Performance Computing (HPC) are long-standing Government priorities, on which substantial progress has been made in recent years.

A strong national approach to cyber security is a prerequisite for building and maintaining trust in AI systems. Under Ireland's National Cyber Security Strategy, Government will protect the security of the country's computer networks and associated

infrastructure, led by the National Cyber Security Centre (NCSC). As the 2021 ransomware attack on the HSE has demonstrated, there is no room for complacency with respect to Cyber Security, and the development of the NCSC will evolve continuously, to reflect its important mandate. AI technologies can be used as a tool to strengthen cyber security, for example, through the deployment of active firewalls or smart antivirus protection.

Under this strategy, Government will build on these strengths to create world-class data, digital and connectivity infrastructure for driving AI development and adoption in Ireland and to solidify our role as a trustworthy data governance hub. Where possible, Government will make more public sector data openly, safely and securely available and will facilitate the development of trusted data sharing mechanisms and research environments to enable access to data and collaboration across different organisations.

Objective

A data, digital and connectivity infrastructure which provides a secure foundation for AI development and use in Ireland

Strategic Actions

- i. Building on initiatives such as the EMPOWER program, provide a framework for trustworthy data governance across the private sector and develop tools and methodologies to apply the framework. [DFHERIS, SFI / DETE, EI, IDA]
- ii. Promulgate standards and guidelines for ethical data sharing within the Public Service [DPER / Data Governance Board].
- iii. Increase the availability of open government data for AI training and testing, including by holding an AI Open Data Challenge [DPER / CSO]
- iv. Identify public sector climate and environmental open datasets to encourage development of AI solutions for climate action [DPER / DECC, EPA, SEAI]

Strand 8: Implementing the Strategy

The AI strategy forms an important part of overall digital strategy for Ireland; the drivers and enablers for AI are very similar to those for other digital technologies. Therefore, the AI strategy will be implemented through the framework that Government is establishing to drive and oversee Ireland's digital transition, with specific strategic actions led by nominated Government Departments, State agencies or other bodies, as set out in the relevant Strands.

An **Enterprise Digital Advisory Board** will be established to advise and work with Government to drive enterprise adoption of digital technologies, including AI. The Board members will include relevant Government Departments, representatives from MNEs and SMEs, AI experts, IDA Ireland and Enterprise Ireland. The Board will be chaired by the Minister of State for Trade Promotion, Digital and Company Regulation. The Board will oversee the implementation of the enterprise elements of the AI Strategy. Government also plans to establish a **GovTech Delivery Board**, which will lead the digital transformation of the Public Service. The Board will consider AI adoption by the public service as part of its work.

To reflect the specific complexities of AI, some additional structures will also be put in place, to deliver the objectives of the strategy.

- **Driving Public Trust in AI**
Building public trust in and engagement with AI will be essential to the overall success of the AI strategy. Government will appoint an AI ambassador to promote awareness among the public and businesses of the potential that AI offers, serving as a champion of AI as

a positive force for the economy and society, and emphasising an ethical approach. The AI ambassador will be a member of the Enterprise Digital Advisory Board and will be supported in their work by the Board and by the Department of Enterprise, Trade and Employment.

- **Driving Standards in AI**

Government has established a Top Team on Standards for AI to expand Ireland's international leadership in AI standards development. Led by the NSAI, the Top Team is working with academia, industry and regulators to develop a roadmap for AI standards.

Ongoing Review of Strategy

This Strategy will be responsive and flexible, in keeping with the rapidly evolving technologies and the issues it must address. As AI technologies and applications develop, there may be a need for new approaches and initiatives that we cannot foresee today. To allow for this responsiveness, Government will develop a detailed action plan, to drive implementation of the strategy, and this action plan will be updated each year to address emerging challenges and opportunities.



Introduction

What is Artificial Intelligence (AI)?

Artificial Intelligence (AI) refers to machine-based systems, with varying levels of autonomy, that can, for a given set of human-defined objectives, make predictions, recommendations or decisions using data.³ Machine Learning, a subset of AI, is software which is able to learn from applicable datasets to self improve, without being explicitly programmed by human programmers.

What is the Opportunity?

AI will play a major role in shaping global competitiveness and productivity over the coming decades, granting early adopters significant societal, economic, and strategic advantages. Globally, it is estimated that the application of AI could double economic growth by 2035⁴

AI-based systems have already begun to permeate many aspects of our daily lives, from the way we work and do business, to the way we communicate and treat diseases. Continued advancements in AI, enabled by sustained investment in areas of national importance, offer opportunities to improve our socio-economic performance and productivity, as well as our environmental and social wellbeing.

AI technologies can drive productivity in all core economic sectors, creating new jobs, enterprises, products and services, as well as new business models. They also provide an opportunity to improve the efficiency and effectiveness of our public service delivery. AI-enabled solutions are transforming a breadth of industries and activities, including agriculture and food, robotics, financial and professional services, transport, sport, healthcare, culture and tourism.

What is the Policy Context?

The recent Economic Recovery Plan and Enterprise 2025 Renewed, the national enterprise strategy, set out an ambition for Ireland to be at the frontier of disruptive technologies, including AI.

Ireland's AI policy development is also underpinned by our engagement in relevant international AI policy and governance processes at the European Union (EU), the United Nations (UN) and the Organisation for Economic Cooperation and Development (OECD). In May 2019, Ireland signed up to the OECD's Recommendation on AI, including a set of voluntary, values-based principles for the responsible stewardship of trustworthy AI.⁵

Digitalisation, including AI, is a strategic priority of the European Commission.⁶ The EU views AI as a critical success factor in achieving the vision of a climate neutral, circular and resilient economy.⁷

The Commission Communication on Artificial Intelligence for Europe (2018) outlined an ambition for Europe to become the world-leading region for cutting-edge, ethical and trustworthy AI. It set out a European approach to AI, resting on three pillars:

1. Boost the European Union's (EU) technological and industrial capacity and AI uptake across the economy
2. Prepare for socio-economic changes
3. Ensure an appropriate regulatory and legal framework.⁸

3. OECD Council Recommendation on Artificial Intelligence, OECD/Legal/0449, (adopted 22 May 2019).

4. See Purdy, M. & Daughery, D. (2016), Why Artificial Intelligence is the Future of Growth, Worldwide: Accenture. https://www.accenture.com/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth--Country-Spotlights.pdf

5. OECD Council Recommendations on Artificial Intelligence, OECD/Legal/0449, (adopted 22 May 2019).

6. European Commission, 2030 Digital Compass: the European way for the Digital Decade, COM(2021) 118 final.

7. European Commission, European Green Deal, December 2019.

8. European Commission, Communication on Artificial Intelligence for Europe [SWD(2018) 137 final], p. 4.

In December 2018, Member States joined forces with the European Commission in a *Coordinated Plan on the Development and Use of Artificial Intelligence Made in Europe*.⁹ Ireland is fully committed to the objectives of this Plan, which proposes joint actions in the following areas: increasing investment; making more data available; fostering talent; and ensuring trust. The Plan was built on in 2020 by an EU White Paper on AI, which set out the aim of fostering a European ecosystem of excellence to encourage the adoption and benefits of AI, as well as an ecosystem of trust in AI through governance and regulation.¹⁰

In April 2021, the Commission presented a proposal for a regulatory framework on AI and a revised coordinated plan on AI, to both promote the development of AI and address the potential risks it poses to safety and fundamental rights. The 2021 review of the Coordinated Plan puts forward four key sets of proposals to seize the opportunities of AI and to facilitate the European approach that is human-centric, trustworthy, secure, sustainable and inclusive:

1. Set enabling conditions for AI development and uptake in the EU
2. Make the EU the place where excellence thrives from the lab to the market
3. Ensure that AI works for people and is a force for good in society
4. Build strategic leadership in high-impact sectors.¹¹

What are the Challenges?

The increasing use of AI-based systems entails potential risks, such as job displacement, opaque decision-making, discrimination, intrusion in our private lives, or use for criminal purposes. There are also challenges in terms of ensuring explainability, accountability and fairness, as well as the safety and security of AI-based systems. It will therefore be important to maximise the benefits of AI for both individuals and society at large, while minimising any adverse risks that could be present.

A regulatory balance must be struck to achieve effective protection against such risks, without unduly stifling innovation.

What is Ireland's Strategic Approach to AI?

AI must advance in a way that builds user confidence and trust, and which is accountable and acceptable to society. Thus, while research and innovation in AI must be enabled, at the same time, an appropriate governance framework based on our ethical values must be provided, to ensure that AI contributes to the public good.

Through this Strategy, *AI – Here for Good*, Government aims to ensure a responsible, rights-respecting and inclusive approach to developing, applying and adopting AI. This will require a strong partnership between Government, our enterprises and innovators, our research communities and civil society; we are all responsible for responsible AI.

In the development of this Strategy, there has been an open and extensive consultation with a wide range of stakeholders on how to successfully drive forward progress in AI together. This has included stakeholder meetings with industry and their representative bodies, with academic and research communities, as well as an online public consultation.



9. European Commission, Coordinated Plan on Artificial Intelligence, COM(2018) 795 final.

10. European Commission, White Paper On Artificial Intelligence - A European approach to excellence and trust, COM(2020) 65 final.

11. European Commission, Communication on Fostering a European approach to Artificial Intelligence, COM(2021) 206 final.

Vision and Objectives

Vision

Ireland will be an international leader in using AI to the benefit of our population, through a people-centred, ethical approach to AI development, adoption and use.



Objectives

1. Strong public trust in AI as a force for societal good in Ireland
2. An agile and appropriate governance and regulatory environment for AI
3. Increased productivity through a step change in AI adoption by Irish enterprise
4. Better public service outcomes through a step change in AI adoption by the Irish public sector
5. A strong Irish ecosystem for high-quality and responsible AI research and innovation
6. A workforce prepared for and adopting AI
7. A data, digital and connectivity infrastructure which provides a secure foundation for AI development and use in Ireland

Strand 1:

AI and Society

Objective

Strong public trust in AI as a force for societal good in Ireland

1.1 Introduction

This strategy is titled “AI – Here for Good” to highlight the transformative potential of AI for addressing many societal, environmental and economic challenges. For example, AI applications can advance our objectives in areas such as climate action, public health, education, housing, urban development, preservation of cultural heritage, food security, human rights, crisis response and disaster management, amongst others. While Government will play a key role in facilitating and enabling AI for Good, this is a journey involving all of society.

AI must be developed and used with trust, transparency and accountability. By making human rights and ethical principles a key focus of one of the eight strands of this Strategy, Ireland is making a commitment to ensuring that AI-based systems and solutions developed and used in this State are trustworthy, fair and inclusive.

1.2 AI for Societal Good and Sustainability

The State is already using AI to address important societal issues, for example in the areas of environment and climate action, health, and social inclusion.

AI FOR ENVIRONMENT AND CLIMATE ACTION

AI has great potential in the area of climate action, where AI applications can be used to monitor and reduce energy usage; provide real-time environmental monitoring and risk management; and to help prevent and mitigate environmental crises among other things. *A new Industrial strategy for a green and digital Europe* (March 2020) links the twin transitions towards climate neutrality and digital leadership in industry.

Ireland's Climate Action Plan 2019 envisages that digital technologies like smart metering (including the use of AI) will play an important role in managing domestic and commercial energy consumption, as well as balancing

the energy grid. At the same time, it is important to recognise the energy demands of AI in the context of environmental and climate changes. AI must be developed in a sustainable manner, balancing benefits against the potential environmental impacts. Data centres in Ireland will be encouraged and supported to embed circular economy principles, as mandated by the *EU Ecodesign Regulation standards*.¹²

Opportunities for AI in climate action will be explored by the Research and Modelling Group convened across the Government system to examine the role of innovation more broadly in climate action.

12. The Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy (2018), together with the Climate Action Plan, outline the opportunity that Renewable Energy Corporate Power Purchase Agreements provide in increasing the amount of renewable energy being used by data centres in Ireland (and consequently the amount of renewable energy being used to power certain types of AI in Ireland). The Sustainable Energy Authority of Ireland (SEAI) is currently undertaking policy research in this area. See <https://dbei.gov.ie/en/Publications/Government-Statement-Data-Centres-Enterprise-Strategy.html>

Case Study: AI to improve energy efficiency and customer services

ESB Networks

ESB Networks are using AI to optimise the rollout of their smart meter technology. Utilising Computer Vision and Machine Learning, *ESB Networks* ensures that its new smart meters are safely and correctly installed. The *ESB Networks* can now easily identify meter readings from photographs – a critical requirement for *ESB Networks* to ensure it can respond to any customer queries quickly. This project won the Intelligent Automation – Best Use of Robotic Process Automation & Cognitive award at the AI Ireland 2019 AI Awards.

ESB's Smart Energy Services

An innovative proof of concept study carried out by ESB's *Smart Energy Services*, together with IBM Research-Ireland, assisted Tesco Ireland to reduce its total annual energy bills by 25%. Savings on refrigeration alone totalled 10Gwh. The study focused on the high energy consumption of refrigeration units in the retail sector, using AI-based analytics and the Internet of Things to identify and validate the savings potential.

AI FOR HEALTH

AI has huge potential in the area of healthcare from improving patient experiences to providing more accurate interventions for patients. AI has played an important role in the global response to the COVID-19 pandemic. Governments around the world are making use of AI in the development of vaccines, in outbreak prediction and modelling, automated contact tracing, intelligent supply chains and space mapping for social distancing, amongst other applications.

AI FOR SOCIAL INCLUSION

While there is a risk that AI could result in new forms of inequalities, it may also offer opportunities to improve access and inclusion - in work, in education, in everyday life, and in making human connections. For example, robots incorporating AI and smart home assistants are being used to assist in providing health and social care.¹³

There is also significant potential for AI to provide educational resources for people with disabilities and special needs.¹⁴ The development of AI-based semantic technologies to extract digital content can render navigation and access easier and more effective for people with low levels of vision. In addition, AI-based innovations like real-time live captioning can assist those with impaired hearing.

STATE INVESTMENT IN THE ONGOING DEVELOPMENT OF AI FOR SOCIETAL GOOD

The State is incentivising research into how AI can be used for societal good through Science Foundation Ireland (SFI), which is investing in this area across all their funding programmes.

Research projects include developing AI for smart and sustainable cities and safer transport; for more efficient agriculture; for improved human health; and for a more robust understanding of the environment. These projects are very often carried out in close collaboration with industry partners. For example, researchers at Lero, the SFI Research Centre for Software, are working with Microsoft to develop AI-based “chatbots” to provide opportunities for young refugees to access and avail of high-quality educational resources in their own languages.

AI for Societal Good is also one of the themes for the *SFI Future Innovator Prize Challenge Fund*, in which interdisciplinary teams are supported to develop AI-based solutions addressing significant national and global societal challenges.¹⁵ Thirteen projects were awarded funding in 2020 to undertake scoping and concept validation activities, with six of these teams progressing to the seed phase for further validation and prototyping of their proposed solutions in the areas of Health, Environment and Sustainability. Building on this initiative, Government will expand on AI for Societal Good Challenge Funds in areas of national importance and for transformative social impact.

13. See <https://www.akara.ai/stevie.html>

14. Irish company iDyslexic has developed a social network-based educational application using AI for people living and working with dyslexia and/or ADHD. See <https://www.thinkbusiness.ie/articles/idyslexic-social-network-dyslexia-adhd-autism-neurodiverse-brendan-morrissey/>

15. <https://www.sfi.ie/challenges/ai-societal-good/>



1.3 Engaging the Public on AI and Building Trust

There are many assumptions and misunderstandings about AI and its short- and long-term impacts on the economy and society. Popular narratives, science fiction, and media hype tend to influence our thinking about AI but are often unrealistic and lacking in nuance.

Building public trust in and engagement with AI will be essential to the overall success of the AI strategy. An important element of this will be the robust ethical and regulatory framework set out in Strand 2. However, Government must also prioritise measures to raise awareness about AI and create meaningful opportunities for public participation in discussion around AI development, governance and use cases.

As part of this strategy, Government will appoint an AI ambassador to promote awareness among the public and businesses of the potential that AI offers, serving as a champion of AI as a positive force for the economy and society. The AI ambassador will lead a national conversation around the role of AI in our lives, emphasising an ethical and compliant approach and leveraging opportunities such as Science Week, sponsored by SFI every November.

To inform the work of the AI ambassador, a Youth Assembly on AI will be convened to discuss young people's attitudes to, concerns about, and visions for an AI-powered future – its benefits, risks and impacts on different groups in society. The Citizen's Assembly model has been successfully used in Ireland to facilitate public engagement on topics such as climate change and gender equality.

Resources such as the Massive Open Online Course (MOOC) on the Elements of AI, hosted by University College Cork (UCC) will be used to educate the general public about AI. This MOOC is freely available and aims to deliver AI education to at least 1% of the Irish population.

Elements of AI Massive Open Online Course (MOOC) - <https://www.elementsofai.com/ie>

"The Elements of AI" is a free online course, already being used in many countries and now being made available here in Ireland by UCC through a dedicated Irish portal. The objective of the course is to encourage everyone, regardless of age or educational background, to learn the basics of AI. In completing the course online at their own pace, students will become familiar with many key concepts from the field of AI and will be provided with a certificate of completion from UCC. The course was originally designed and organised by the University of Helsinki and Reaktor, a Finnish technology company. It has been made available for free in all Member States by the Finnish EU presidency of 2019. An Irish language version of the course will be released in 2021.

Objective

Strong public trust in AI as a force for societal good in Ireland

Strategic Actions

- i. Appoint an AI Ambassador to champion AI as a positive force for the economy and society [DETE]
- ii. Open a conversation with children and young people about AI through Comhairle na nÓg the national structure for consultation with children and young people [DETE / DCEDIY]
- iii. Promote and expand courses which educate the general public about AI [DFHERIS]
- iv. Expand AI for Societal Good Challenge Funds [DFHERIS, SFI / DPER / relevant Departments]
- v. Include opportunities for AI in climate action as part of the development of future climate policies [DECC / DFHERIS, SFI / DETE / DoT]

Strand 2:

A Governance Ecosystem that Promotes Trustworthy AI

Objective

An agile and appropriate governance and regulatory environment for AI

2.1 Introduction

The use of AI-based systems brings risks such as opaque decision-making, discrimination, bias, privacy issues, or use for criminal purposes. There are also challenges in terms of ensuring explainability, accountability and fairness. Successful and smooth deployment of AI across the economy and society requires a robust governance framework to safeguard against these risks and underpin public trust in AI. Such a framework must balance the need to ensure that businesses and organisations can reap AI opportunities, with the need to protect citizens and consumers against potential risks.

Government will ensure a strong governance framework for AI, based on three pillars:

- An agile and appropriate legal framework;
- Active promotion of ethics guidance and frameworks; and
- A robust system of standards and certification.

2.2 Potential Risks of AI

POTENTIAL FOR DISCRIMINATION AND BIAS

There is a risk that AI systems could lead to unfair discrimination and unequal treatment.¹⁶ The risk of discrimination can arise in many ways, for instance biased training data, biased design of algorithms, or biased use of AI systems.

AI-based systems have the potential to exacerbate existing structural inequities and marginalisation of vulnerable groups. For instance, AI-based facial recognition technology that has been trained disproportionately on lighter skin tones may be significantly less accurate in relation to people of colour and can thus exhibit higher false positive rates for this population.

The effects of decision-making and profiling by unfairly biased and discriminatory AI-based systems can be far-reaching. Public administrations around the world are experimenting with the use of algorithmic decision-making and predictive analytics in high-stakes areas such as policing, housing assistance, healthcare and eligibility for social benefits. In the private sector, the use of algorithms in decision-making can also have significant effects, for instance in decisions concerning recruitment or access to insurance and credit.

TRANSPARENCY AND ACCOUNTABILITY

Transparency in the use of AI systems is critical for building public trust. The opaque nature of many AI algorithms may also obscure the reasoning behind AI-based decisions and can cause problems from the perspective of explainability and accountability. It is therefore important to ensure that information about how AI systems make consequential decisions is public and understandable.

16. See for example Safiya Noble, *Algorithms of Oppression* (2018); Virginia Eubanks, *Automating Inequality* (2018); Ruha Benjamin, *Race After Technology* (2019); Meredith Broussard, *Artificial Unintelligence* (2018); Angwin, J., Larson, J. Mattu, S. and Kirchner, L., 'Machine Bias', ProPublica. 23 May 2016.



2.3 Legal Framework for Trustworthy AI

PROPOSED EU HORIZONTAL REGULATORY FRAMEWORK FOR AI

The European Commission sees a clear European regulatory framework for AI as essential to building public trust, and therefore for accelerating uptake, innovation and investment in these technologies. The Commission *White Paper on Artificial Intelligence – a European approach to excellence and trust* (2020) outlined the main principles of a future EU regulatory framework for AI and proposes to establish an ‘ecosystem of trust’ (as well as an ecosystem of excellence) in order to address the perceived risks that AI may present. The Irish national position on the European Commission’s White Paper on AI can be viewed online.¹⁷

In April 2021, the Commission proposed legislative action on a horizontal framework for AI, focusing on issues of safety and respect for fundamental rights.¹⁸ The combination of the proposed Regulation and a new Coordinated Plan on AI with Member States is intended to provide for an ecosystem of trust. The proposed new rules are designed to be proportionate and

flexible, following a risk-based approach to address the specific challenges posed by different categories and applications of AI systems (classified as unacceptable risk; high-risk; limited risk, and minimal risk).

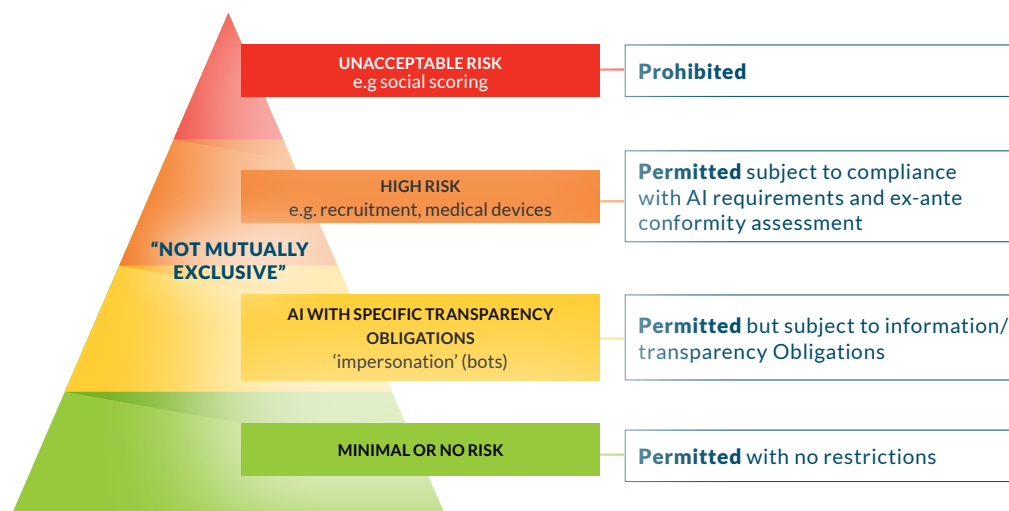
Ireland will continue to play an active part in discussions at EU level to define a balanced and future-proof regulatory framework that ensures the protection of fundamental rights, while fostering innovation and harnessing the opportunities presented by AI.

Given the evolving nature of and challenges posed by AI, flexibility and experimentation can be important elements to ensure an innovation-friendly, evidence-based and resilient governance framework. Mechanisms for voluntary and self-regulatory oversight of AI will be considered for non-high-risk AI, for example, pilot programs, standards, labelling and certification schemes and regulatory sandboxes. Other policy tools such as impact assessments, industry-led codes of practice and ethical guidelines will also be used. Such a multi-faceted approach effectively integrates laws, regulatory institutions and voluntary systems. We believe that this ‘smart mix’ of voluntary and mandatory measures will help to protect our people, facilitate innovation in AI and respect our democratic values.

17. See <https://dbai.gov.ie/en/Publications/National-Submission-EU-White-Paper-on-AI.html>

18. Proposal for a Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act), COM(2021) 206 final and Communication on Fostering a European Approach to AI, COM(2021) 205 final.

A Risk-Based Approach to Regulation



ROLE OF RELEVANT NATIONAL AUTHORITIES AND REGULATORY BODIES

An effective system of monitoring and enforcement is an essential component of the governance framework for AI. The proposed EU rules on AI will be enforced through a governance system at Member State level based on a system of notifying authorities, and a cooperation mechanism at Union level with the establishment of a European Artificial Intelligence Board.

Government will consider the establishment of an appropriate mechanism for ensuring a coordinated approach by different regulators in Ireland to digital, including AI, as part of the forthcoming National Digital Strategy.

EXPERIMENTAL REGULATION – REGULATORY SANDBOXES FOR AI

In its proposed new regulation for AI, the EU encourages Member States to establish regulatory sandboxes to give small and medium enterprises the opportunity to experiment with innovative AI approaches and provides a specific framework to do so.¹⁹ Such sandboxes provide a structured context for experimentation, enabling the testing of innovative technologies, products, services or approaches in a real-world environment and for a limited time, under regulatory supervision and ensuring that appropriate safeguards are in place. They are particularly useful in areas where there is uncertainty about how regulations

should be interpreted. The Government will consider the potential and requirements of regulatory sandboxes for AI in selected sectors.

IMPACT OF AI ON EXISTING REGULATION

Much of the existing regulatory acquis also applies in the context of AI. However, given some of the novelties posed by AI, some legal gaps may emerge where existing regulations do not yet offer legal certainty or do not comprehensively tackle the potential adverse effects of AI. In some cases, the gap can be bridged with interpretive guidance. However, in other instances updated or new regulation may be needed.

In addition to proposals at EU level for the regulation of AI, work is ongoing at national level to examine and address legal gaps for AI. For example, the Company Law Review Group submitted a report on AI to the Tánaiste and Minister for Enterprise, Trade and Employment in December 2020, which analysed possible impacts of the increased use of AI in the context of company law and corporate governance matters.²⁰

This work to address regulatory gaps spans a wide range of legal and regulatory regimes including data protection; justice; policing; intellectual property; transport and haulage; finance; health; human rights, export controls; consumer protection; competition law and company law.

19. EU Council Conclusions on Regulatory Sandboxes and Experimentation Clauses as tools for an innovation-friendly, future-proof and resilient regulatory framework that masters disruptive challenges in the digital age (16 November 2020).

20. Company Law Review Group (2020), Special Report No 4, Report on Potential Impact of Artificial Intelligence on Company Law in the Context of Corporate Governance, 22 December 2020.

2.4 Ethics and International AI Governance

AI systems should also respect the ethical values of society. In recent years, a number of ethics frameworks for AI have been developed in order to encourage developers and deployers of AI to integrate ethical considerations throughout the AI systems entire lifecycle. Most relevant within a European context are the EU Ethics Guidelines for Trustworthy AI.

THE EU ETHICS GUIDELINES FOR TRUSTWORTHY AI

The *EU High-Level Expert Group on AI (HLEG on AI)* was established by the European Commission and published a set of *Ethics Guidelines for Trustworthy AI* in

April 2019 after a wide stakeholder consultation, which were subsequently endorsed by the Commission.²¹ An *Assessment List for Trustworthy AI (ALTAI)* accompanies the Guidelines and provides an operational framework to support their application by AI developers and users. A practical web-based tool has been developed to facilitate compliance and is hosted by the Insight Centre for Data Analytics at UCC, funded by SFI.²²

Government's approach to driving AI adoption by businesses will have ethics at its heart. This will be assisted by the National AI Innovation Hub which (together with the other European Digital Innovation Hubs) will provide advisory support to businesses to help them in assessing the trustworthiness of AI systems. This will include providing case studies and toolkits for SMEs to implement ethical and trustworthy AI.

EU High Level Expert Group on AI: Ethics Guidelines for Trustworthy AI

The EU High Level Expert Group on AI (AI HLEG), an independent expert group set up by the European Commission, published a set of Ethics Guidelines for Trustworthy AI in April 2019. They provide a useful framework to consider the challenges posed by AI, based on three main components: (i) legality; (ii) ethics; and (iii) robustness.

The Guidelines list seven more detailed requirements:

- Human agency and oversight
- Technical robustness and safety
- Privacy and data governance
- Transparency
- Diversity, non-discrimination and fairness
- Environmental and societal well-being
- Accountability.

Online Tool for Assessment of Trustworthy AI

The Assessment List for Trustworthy AI (ALTAI) is a check list of questions for business and organisations to assess whether the AI system that is being developed, deployed or procured adheres to the seven requirements of Trustworthy AI, as specified in the EU AI HLEG Ethics Guidelines.

An online tool, hosted by the Insight Centre at UCC, is available at: <http://altai.insight-centre.org> for all users wishing to assess their AI systems and products. The tool has been designed to practically guide developers and deployers of AI through an accessible and dynamic checklist for the seven requirements of trustworthy AI.

21. European Commission (2019), Communication on Building Trust in Human-Centric Artificial Intelligence.

22. Assessment List for Trustworthy Artificial Intelligence (ALTAI) for self-assessment, available at <https://ec.europa.eu/digital-single-market/en/news/assessment-list-trustworthy-artificial-intelligence-altai-self-assessment>.

INTERNATIONAL AI GOVERNANCE

A human rights-based approach to AI is increasingly supported by multilateral standard-setting organisations, such as the United Nations (UN), the UN Educational, Scientific and Cultural Organisation (UNESCO), the Organisation for Economic Cooperation and Development (OECD) and the Council of Europe.²³ Human rights are protected by law and as such should underpin ethics guidance for AI.

In May 2019, the OECD released a *Recommendation on Artificial Intelligence*, which includes a set of *Principles for responsible stewardship of trustworthy AI*.²⁴ The OECD also provides the secretariat for the *Global Partnership on AI (GPAI)* launched in July 2020.

Global Partnership on AI (GPAI)

GPAI is an international, multi-party initiative bringing global experts together to foster collaboration and coordination on applied AI issues. It is supported by a secretariat hosted at the OECD, along with Centres of Expertise in Montréal and Paris.

Four working groups have been formed to focus on the following themes:

- responsible use of AI (*including a subgroup on AI in the Pandemic Response*)
- data governance;
- the future of work;
- innovation and commercialization

At Council of Europe level, an *Ad Hoc Committee on Artificial Intelligence (CAHAI)* has been established to examine the feasibility and potential elements of a legal framework for the development, design and application of AI. Recognising the limitations of voluntary ethics guidelines, the CAHAI explicitly aims at ensuring the protection of human rights, democracy and the rule of law through a mix of binding and non-binding legal instruments, possibly including a new international convention on AI. At UNESCO, work has begun on a draft *Recommendation on the Ethics of*

Artificial Intelligence, to be adopted later this year. Irish representatives are actively participating in these discussions.

Ireland will continue to monitor and participate in discussion on AI governance in these multinational fora.

ETHICAL AND HUMAN RIGHTS IMPACT ASSESSMENTS OF AI SYSTEMS

Impact assessments are an important tool to identify and mitigate any potential risks of adverse impacts of AI. These impact assessments can be carried out voluntarily under an ethics-based approach, but they can also be incorporated under a binding legal framework.

EU law already requires Impact Assessments in specific sectors, such as Data Protection Impact Assessments (DPIAs) under the GDPR. The Assessment List for Trustworthy AI (ALTAI), specifically refers to the need to perform a fundamental rights impact assessment for AI systems and provides examples of relevant questions for this purpose.²⁵ The Council of Europe also recommends that Governments should conduct human rights impact assessments in the area of AI.²⁶

Deploying AI in certain public service areas - for example policing - will require particular attention from an ethical and human rights perspective. In driving public service adoption of AI, the GovTech Delivery Board will consider appropriate safeguards - including the potential use of impact assessments - to ensure that the use of AI within the Public Service is consistent with ethical principles and with human rights obligations.

PROMOTING RESEARCH ON ETHICAL AND SOCIETAL IMPLICATIONS OF AI

AI applications and implications are multidisciplinary and can raise complex new ethical and societal issues. To respond appropriately, an interdisciplinary approach should be taken, incorporating a broad range of perspectives, including engineering, natural and social sciences, law, arts and the humanities. It is important that interdisciplinary perspectives on AI be integrated into technology education and training to build the capacities of developers, policymakers and regulators to understand the multi-faceted impacts of AI systems.

25. EU High-Level Expert Group on Artificial Intelligence, Assessment List for Trustworthy Artificial Intelligence (ALTAI) for self-assessment, 17 July 2020, p.5.

26. Council of Europe Commissioner for Human Rights, 'Unboxing Artificial Intelligence: 10 Steps to Protect Human Rights' (Council of Europe, May 2019). Available at <https://rm.coe.int/unboxing-artificial-intelligence-10-steps-to-protect-human-rights-reco/1680946e64>

Research on Ethical and Societal Impacts of AI

Recognising the need to ensure an ethical and evidence-informed approach to the development of AI in Ireland and to build research capacity to address the key societal challenges posed, research in these areas is ongoing at numerous research institutions in Ireland, including those supported by SFI.

For example, University College Dublin (UCD) hosts a *Machine Ethics Research Group*²⁷ and Dublin City University (DCU) hosts an *Institute of Ethics*²⁸, with projects on inclusive robotics, as well as on privacy and big data. Trinity College Dublin offers an ‘Ethics Lab’ elective and an ‘Ethics Canvas’, including consideration of questions around the future use of AI systems.²⁹

Ireland also participates in numerous European research initiatives in this area: Technological University Dublin is one of eight partners in a pilot initiative of the “European University of Technology – Eut+” Alliance to prepare technologically responsible citizens through European Universities of the future.³⁰ Supported by the European Commission, Trinity has established the international and interdisciplinary HUMAN+ fellowship program, led by the Long Room Hub Arts and Humanities Research Institute and the SFI ADAPT Centre. It includes a project on the Ethics of AI and connects researchers from the arts and humanities with researchers from computer sciences and engineering, with the aim of driving technological innovations from the human perspective.³¹

In 2021, the ADAPT Centre, Science Gallery Dublin and other partners engaged in an innovative multidisciplinary collaboration between artists and technologists on the theme of bias, exploring AI, Ethics, Trust and Justice.³² In a Europe-wide first, a cutting-edge law and technology module has been rolled out for undergraduate students at Maynooth University.

2.5 Standards and Certification for Trustworthy AI

STANDARDS

Standardisation is key to delivering the accountability and trust needed to ensure commercial and societal acceptance of AI. Standards provide an important means to give technical effect to a principle or regulation in a way that can be evaluated, compared and certified, thereby offering a compliance pathway. To support the role of standards, assurance tools and services are also needed. Existing models of assurance – audits, certification schemes, accreditation processes and impact assessments – can all form part of an AI assurance ecosystem.

Ireland, through the National Standards Authority of Ireland (NSAI), participates in the International Standards Organisation (ISO), which is undertaking standardisation work relating to AI.³³ There is already a well-developed expertise in AI Standardisation here in Ireland and the ADAPT Centre, in collaboration with NSAI, has secured over €1 million in EU funding to recruit and train the next generation of international standards experts.

Ireland established a Top Team on Standards for AI in 2020, with the ambition to expand Ireland’s international leadership in AI Standards development. Led by the NSAI, the Top Team is working with academia, industry and regulators to develop a roadmap for AI Standards and Assurance. It will also explore what guidance and assistance is needed for Irish enterprises and organisations to embrace AI safely and ethically, utilising standards that are published and in development.

27. <https://aristotle.ucd.ie/#about>

28. <https://www.dcu.ie/ethics>

29. <https://www.tcd.ie/trinity-electives/electives/The-ethics-lab/> and www.ethicscanvas.org

30. <https://www.univ-tech.eu/>

31. <https://humanplus.ie/>

32. <https://dublin.sciencegallery.com/bia>

33. ISO/IEC JTC 1 SC 42.

CERTIFICATION

Certification schemes or codes of conduct (whether voluntary or mandatory) are another way of building trust in AI systems and providing a pathway to compliance. Certification can provide independent and effective assurance that the protection and security of personal data involved in the training, testing, and application of AI algorithms, models and systems accords with international and Irish standards. This can be used to drive efficient, responsible, accountable and ethical AI data processing of personal data. For example, the Code of Conduct and Certification mechanisms under the General Data Protection Regulation (GDPR) are a means by which compliance with that Regulation can be verified.

This can be especially helpful and advantageous where the outcomes of AI usage in data processing operations may lead to decisions that have impact or a risk to individuals. It is possible these risks can be

significant in some cases and that this could lead to bias, discrimination or a limitation of rights.

The Top Team on Standards will examine ways to support the development of certification schemes and codes of conduct to address particular aspects of AI processing or different stages of AI development and operations in areas such as:

- explainability and transparency
- determination or demonstration of fairness
- estimations of bias in training data
- mechanisms to effectively audit AI systems
- securing AI datastores and training sets
- data minimisation and anonymisation techniques that provide for effective outputs or AI “decisions”
- effective support for GDPR rights in AI systems
- design principles for AI systems that ensure effective data protection

Objective

An agile and appropriate governance and regulatory environment for AI

Strategic Actions

- i. Continue to play an active part in discussions at EU level to define a horizontal regulatory framework for AI [DETE]
- ii. Consider an appropriate mechanism for ensuring a coordinated approach by Irish regulators to Digital, including AI, as part of the forthcoming National Digital Strategy [DOT/ DETE / DECC / D/Justice/ DTCAGSM / DCEDIY]
- iii. Examine and promote ways to help businesses self-assess the trustworthiness of their AI systems, including through development of case studies and toolkits for SMEs [DETE/ EI, IDA / DFEHRIS]
- iv. Publish a Standards and Assurance Roadmap for AI. [DETE-NSAI]
- v. Investigate the potential and requirements of regulatory sandboxes for AI [DETE-NSAI / DETE- EI/IDA / DFEHERIS-SFI]
- vi. Join the Global Partnership on AI [DETE/ DFA]
- vii. Continue to advocate within multilateral fora for an ethical and human rights-based approach to AI [DFA/other Departments as appropriate]
- viii. Consider the implications of AI as part of a planned review of equality legislation [DCEDIY]

Strand 3:

Driving Adoption of AI in Irish Enterprise

Objective

Increased productivity through a step change in AI adoption by Irish enterprise

3.1 Introduction

AI is an area that is developing rapidly, and this presents major opportunities for Irish enterprises. Globally, it is estimated that the application of AI could double economic growth by 2035.³⁴ PWC has forecasted that AI will boost Ireland's GDP by 11.6 % or €48 billion in 2030.³⁵ Businesses can use AI to improve existing products, develop new products, and increase their understanding of customer needs. AI adoption can also deliver efficiencies, process improvements and increased production quality for businesses. AI can help to foster a workforce culture of problem solving and self-learning, and improve the diffusion of innovation.

Ireland is the location for the European headquarters of many of the largest global Information and Communications Technology (ICT) businesses, and our technology-oriented businesses already form a solid base for the successful development, commercialisation and use of AI. In the 2020 Government AI Readiness Index, Ireland ranks second in the world in terms of the technology sector metrics (based on per capita measures). However, AI is not just for leading edge businesses. The greatest economic benefit of AI will be generated by widespread adoption of AI technologies by enterprises of all sizes – from small SMEs through to MNEs - to enhance their productivity.

Under the AI strategy, Government will drive widespread adoption of AI across the Irish enterprise base through a phased approach of awareness-building, opportunities to experiment and pilot, assistance with planning and capacity building for AI, and assistance for implementation. Government will also encourage and facilitate the continued and growing interaction between research and industry on AI, as well as encouraging collaboration and spillovers between SMEs and global businesses located in Ireland. We will promote the use of AI to transform our economy, fundamentally rethinking business models to reap productivity gains and create new areas of growth.

33. See Purdy, M. & Daughery, D. (2016), Why Artificial Intelligence is the Future of Growth, Worldwide: Accenture. https://www.accenture.com/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth--Country-Spotlights.pdf

34. <https://www.pwc.ie/publications/2017/economic-impact-of-artificial-intelligence-ireland-economy-report.pdf>



3.2 Readiness of Irish Enterprise to Adopt AI

There is a growing number of businesses in Ireland that are moving towards digitalisation and integration of AI into their business models. From a small base of companies in the early 2000s, Enterprise Ireland has seen a steady growth in the number of AI entrepreneurs and start-ups assisted by the agency - from companies that have used AI algorithms to provide data analytical services, to a range of applications including customised voice-driven customer experiences; global procurement tendering services; and educational course assessment. AI has become an important productivity driver for a wide range of sectors, including technology, financial services, agriculture, mobility, engineering and life sciences. In addition, there has been a growing number of SMEs adopting AI into their existing business models and operations to improve competitiveness and product development. Typical uses of AI by Irish businesses include optimising manufacturing practices, improving customer services, supply chain optimisation and risk management.

What Does AI Offer to SMEs?

For most Irish SMEs, the best way to benefit from AI will be by purchasing an off-the shelf AI package. There is a wide range of AI applications that businesses can use to understand their customers better, to transform their business processes, and to improve their products:

Understanding customers

AI is already helping businesses around the world gain a better understanding of their customers' behaviours and their needs. Businesses generate a lot of data as part of their daily operations, for example sales data or website data. AI can help to translate that data into simple insights that allow businesses make better decisions about where and how to invest their time and money. For example, helping to identify and predict which customers are most likely to buy a product or service. Businesses can then focus their efforts on these customers – improving productivity and efficiency.

Transforming processes

AI can transform a business's way of working by taking making its processes more efficient. Offering personalised recommendations to customers, tailored advertising, and chatbots are all examples of artificial intelligence being used by businesses to improve their processes to make them more efficient and more cost-effective, and to free up staff to perform more unstructured and unpredictable tasks. Businesses can also use AI-powered tools to perform routine tasks such as processing orders, issuing refunds, or verifying customer data. Allowing AI to look after the simpler tasks means that staff are free to allocate their time to activities that will improve overall business productivity. Using AI to automate these simple 'back-office' tasks offers a quick return on the investments made in AI.

Improving products

AI can be used to improve the products that businesses offer. AI can be used to improve decision making by harnessing the large amounts of information that all businesses generate more effectively. It can offer insights that help reduce human error or biases that might be present when creating budgets, predicting cost, and planning project timelines for developing new products.

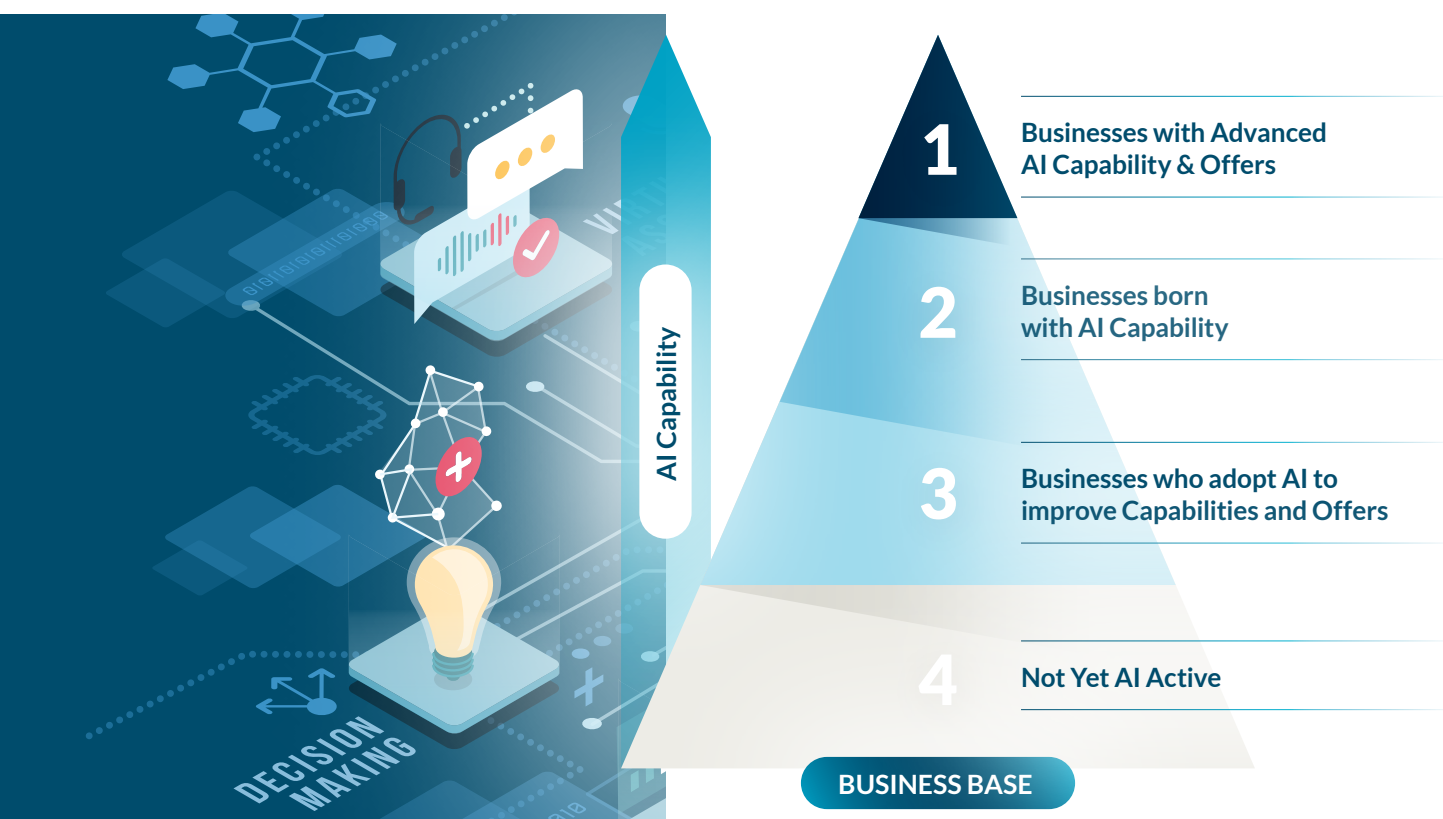
In addition to improvements in product development, AI can also bring about improvements in the quality control of products. AI can be trained to learn the aspects or characteristics of a product that are important and create rules that define quality parameters. This is particularly of use where the quality of a product is subjective, subtle, or not necessarily fixed. AI powered quality control can subsequently learn where the risks to quality control are likely to come from more broadly and provide solutions. This means AI can make quality control faster, cheaper, and more precise.

Ireland also ranks favourably amongst EU countries in terms of enterprise AI adoption, recording the highest share of enterprises using one of four key AI applications in 2020.³⁶ In the same year, a European Commission enterprise survey indicated 35% of Irish businesses have adopted at least one AI technology.³⁷ However, more than half of the businesses surveyed (52%) have neither adopted AI, nor plan to do so. This mirrors the results of earlier surveys of Irish enterprise leaders in 2019, which revealed a lack of expertise, appetite and clarity about how to introduce AI and related technological solutions.³⁸

From an AI capability development perspective, the Irish enterprise base falls into four main categories:

1. A small number of leading-edge AI businesses
2. A small number of enterprises who are ‘born native’ AI players or established clients who started AI-native offerings
3. A small but growing number of enterprises that are developing and/or integrating AI into their business.
4. Majority of enterprises that are not yet engaged in the development of AI capabilities.

Figure 3.1: Business AI Capability - Four Main Types



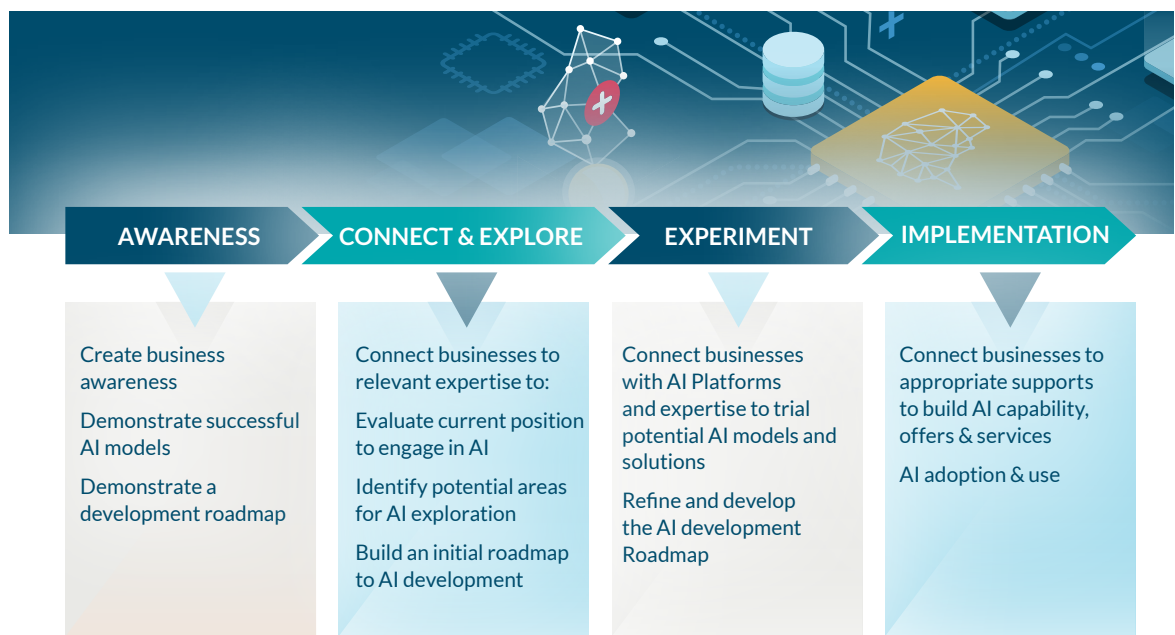
To fully realise the economic benefits of AI, businesses need to be aware of the opportunities that AI represents, and be open to adopting AI technologies to increase their productivity and competitiveness. For many businesses, the decision to embed AI into their processes is a major one which requires an investment of time, resources and trust. There are multiple factors around technology, business model, value proposition, people and skills, technology development, funding and change impact that must be considered by enterprises in order to plan and implement successful AI adoption. Therefore, in advance of making the commitment to AI transformation, businesses need to undertake an AI development journey which addresses their needs, from the initial awareness stage to eventual implementation. The State will put in place strong and appropriate support systems to assist businesses in progressing through the AI development ladder.

36. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210413-1>

37. European Commission, European enterprise survey on the use of technologies based on artificial intelligence, a study prepared for DG Communications Networks, Content & Technology by Ipsos and iCite, 2020.

38. See <https://www.pwc.ie/issues/artificial-intelligence-six-priorities.html>; <https://www.nsai.ie/about/news/four-in-ten-irish-companies-currently-use-artificial-intelligence-ai/>

Figure 3.2: Business AI Capability - Four Main Types



3.3 Driving Adoption of AI by Irish Enterprises

Many global ICT businesses with significant AI strengths have their European head-quarters in Ireland, and there is also much potential for learning from SMEs that have completed the AI journey. Government sees an opportunity to benefit from this expertise and experience by partnering with Industry to drive AI adoption across the enterprise base. We will establish an **Enterprise Digital Advisory Board**, with membership drawn from Industry, to work with and advise Government in achieving the objective of a step change in AI adoption by Irish enterprise.

Enterprise Ireland and IDA Ireland will both play a lead role. These agencies are already supporting enterprises in working with AI, through R&I Funding and assistance, and through targeted initiatives such as the “Earth Observation” programme of the European Space agency which provides valuable data sets for AI and data analytics projects. Enterprise transformation (for which AI will be a significant lever) is a strategic pillar for both agencies in their respective strategies launched at the beginning of 2021.

Working with its enterprise development agencies and the Local Enterprise Offices, and advised by the Enterprise Digital Advisory Board, Government will use the AI development ladder framework set out in figure 3.2 above to drive a phased approach to AI adoption - from awareness-raising through opportunities to connect, explore and experiment with AI, to assistance for implementation - which can be rolled out to enterprises, with a focus on SMEs and small businesses across the country.

Opportunities for Businesses to Experiment with AI Solutions



In recognition of the challenges that must be addressed to help SMEs in adopting AI and digitalisation, the European Commission, together with Member States, is establishing a network of European Digital Innovation Hubs (EDIHs) to play a central role in stimulating the broad uptake of AI, High Performance Computing (HPC) and Cybersecurity as well as other digital technologies by industry (in particular SMEs and midcaps), as well as by the public sector.

Government is committed to establishing a number of European Digital Innovation Hubs (EDIHs) in Ireland under this initiative, and a competitive process has been launched to identify candidates for national EDIH designation.

The EDIHs will serve as “one stop shops” to provide upskilling, innovation and advisory services (including

in the area of standards, data protection, ethics and regulatory compliance) to enterprises and public authorities in areas aligned to AI, as well as offering access to technical expertise, research facilities and experimentation. The Hubs will act as SME incubators, providing access to infrastructure, technologies and test beds. At the core of each EDIH will be a Research and Technology Organisation or Higher Education Institution lab.

While all of the national EDIHs will provide valuable resources for SMEs on the AI adoption ladder, one of the successful candidates will be specifically designated as a **National AI Digital Innovation Hub**. This Hub will take on the role of the National First Stop for AI, acting as the point of contact for businesses in engaging with AI adoption and the AI innovation ecosystem.

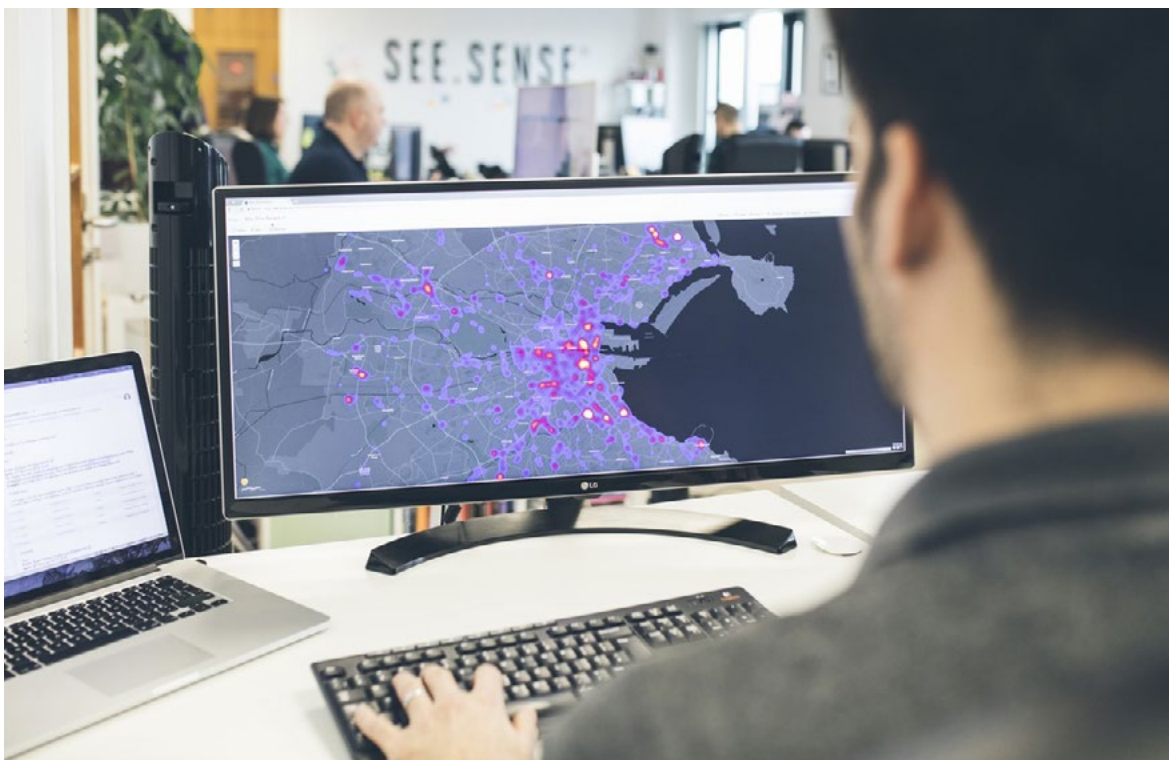


Access to AI Technology Demonstrators and Applied Research

EI and IDA have established a network of Technology Centres which provide a valuable resource for enterprises in experimenting with AI and accessing applied and Industry-focused AI research. The centres provide facilities for SMEs, MNEs and research institutions to collaborate on market focused innovation. Of particular relevance is **CeADAR**, Ireland's National Centre for Applied Artificial Intelligence, which makes AI demonstrators and prototypes available to businesses, so that they can trial AI technologies before committing to adoption. **CeADAR** has linked up and connected with over 1,000 businesses in Ireland to strengthen their AI competence and accelerate their adoption of AI.

Also of interest in terms of applied AI is **IMR – the Irish Manufacturing Research Centre**. IMR works with the manufacturing industry to demystify, derisk and deliver emerging technologies and new knowledge, such as AI, enabling industry to succeed at the cutting edge of advanced manufacturing.

EI also runs a **Technology Gateway Network**, in partnership with Institutes of Technology and Technical Universities, which provides local access points for businesses to the Irish research infrastructure, and delivers technology solutions for enterprise. Another important resource for businesses that want to engage with the Irish research base is **Knowledge Transfer Ireland**, funded by EI, which helps businesses to access State-funded technology, ideas and expertise.



CeADAR: Ireland's National Centre for Applied Artificial Intelligence

CeADAR is a market-focused technology centre, funded by EI, that drives the accelerated research, development, and deployment of AI and data analytics technology and innovation into business. In consultation with industry, CeADAR has developed an extensive catalogue of technology demonstrator projects in the broad areas of AI, data analytics and machine learning, which can be used to trial potential AI models and solutions. The intellectual property behind the industry-focused technology development is then available for integration into businesses either directly or via licence to industry. Recently over 65% of licences have been for Irish-based SMEs, for adoption into their business.

CeADAR's work focuses on developing tools, techniques and technologies that enable more people, organisations and industries to use AI and analytics for better decision making, unlocking of hidden insights in data and strengthening competitive advantage. The Centre acts as a bridge between the worlds of applied research and commercial deployment. Industry membership of CeADAR now totals 90 industry partners, ranging from multi-nationals to indigenous SMEs.

CeADAR's areas of strength include:

- predictive analytics
- machine and deep learning
- artificial intelligence
- real-time analytics
- text analytics and natural language processing
- data visualisation
- blockchain and smart contracts
- computer vision and image analytics



Above: This project with InvertRobotics and CeADAR uses a vertically-climbing robot and Artificial Intelligence to automatically inspect containers, tanks, piping and any confined or hazardous space.

Left: This project with ProvEye and CeADAR uses high-resolution drone imagery and Artificial Intelligence to map threatened habitats which are protected under European law

FINANCIAL SUPPORTS FOR AI DEVELOPMENT AND IMPLEMENTATION

EI assists a growing number of enterprises and research organisations that have engaged in AI projects, through a range of existing R&I funding schemes (Exploring Innovation, Agile Innovation, and R&I funds). Other funding measures that are suitable for AI R&I projects include the Commercialisation Fund, Regional Enterprise Development Fund and Small Business Innovation Research programme.

AI technology development is one of the many deep technology sectors that has been financed by the EI Seed and Venture Capital Scheme for many years. EI also works with co-funders in providing linkages to the industry base that is actively engaged in building AI products and services.

A €500 million Disruptive Technologies Innovation Fund (DTIF) led by the Department of Enterprise, Trade and Employment, is designed to drive collaboration between Ireland's research base and industry to develop novel technologies capable of transforming business. Starting in 2021, the third call of the DTIF will see 29 projects receive €95 million in funding over the next three years. This round of the Fund covers areas such as life sciences, medical devices, ICT, AI, manufacturing and environmental sustainability. Funding has been directed at AI solutions across a number of industry sectors, including video production; criminal justice and security; patient empowerment; and decision support systems in medical care.

Government will expand the existing funding offering with targeted funding supports that are suitable for the implementation needs of businesses on the AI development ladder - for whom the best route to AI adoption will often be to acquire off-the-shelf AI solutions. This funding will be augmented with diagnostic tools and other advisory assistance that can be used to inform decision-making around implementation of AI solutions.

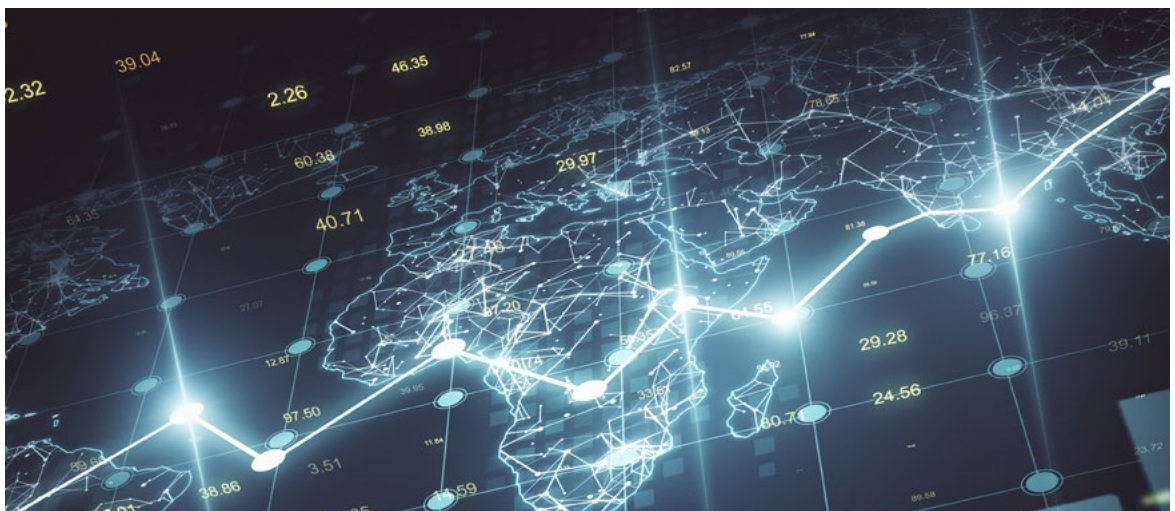
The European Commission has made digital transformation (including through AI technologies) one of the pillars of its €672.5 billion Recovery and Resilience facility, which has been developed to mitigate the economic and social impact of the coronavirus pandemic. Ireland's National Recovery and Resilience Plan includes an €85 million programme to drive the adoption of digital technologies (including AI) by businesses.

DEVELOPMENT OF A NATIONAL AI CLUSTER

The high representation of global leading AI firms in Ireland provides an opportunity to develop a national AI cluster or platform which will drive collaboration between multinational enterprises and SMEs, with the objective of stimulating knowledge and technology spillovers and building scale in AI. The Department of Enterprise, Trade and Employment and its agencies, EI and IDA Ireland, will work together with the Enterprise Digital Advisory Board to develop this AI Cluster.

TECHNOLOGY AND INFRASTRUCTURE REQUIREMENT FOR WIDESPREAD AI ADOPTION

Strand 7 of this Strategy sets out the existing and planned infrastructure to position Ireland as a leading location for cutting edge development and use of AI. There is also a need to ensure easy technical and administrative access to AI infrastructure by SMEs and larger businesses, and to remove barriers to collaboration between public bodies, academia and businesses on AI innovation. Government will consider options for an open and consistent mechanism that supports access to cloud based solutions for businesses adopting AI, and addresses inconsistencies and inefficiencies that are a barrier to AI innovation and use. This will inform the development of a national data and AI infrastructure platform to promote appropriate access to data and technology for AI across sectors.





3.4 AI Sectoral Opportunities

While AI offers opportunities for most enterprises, its deployment may take different forms across sectors, depending on the levels of their technological maturity, the availability and relevance of industry-specific applications and the desired business, operational and societal objectives for the sector.

AI offers opportunities in sectors where Ireland has comparative advantages or opportunities, and in technology fields with the highest acceleration potential, for example ICT; biopharmaceuticals, healthcare and medical technologies; agri-foods; energy; financial and business services; the creative sector; and potential GovTech offerings.

A number of sectors have also been suggested for prioritisation of AI development and adoption at EU level. The *EU White Paper on AI* places emphasis on using AI in areas where Europe is particularly strong (machinery, transport, cybersecurity, farming, the green and circular economy, healthcare and high value-added sectors like fashion and tourism); and for services of public interest, for example, by reducing the costs of providing services (transport, education, energy and waste management).

AI initiatives are already being implemented by enterprises in Ireland in areas such as AgriTech, sustainable food supply chain, livestock health and safety, building construction waste reduction, sustainable farming, marine science and aquaculture, health, and in creative and design industries. This demonstrates that Ireland already has solid foundations for introducing AI innovations at the enterprise level. Government will build on this, focusing on the spread and application of AI across the wider economy, as well as in sectors of strategic interest, aiming to incentivise uptake.

3.5 Opportunities for Enterprise Collaboration on AI

ENGAGEMENT BY IRISH ENTERPRISES IN EU COLLABORATION FOR AI

Promoting investment, innovation and implementation of AI is a priority for the European Commission, and this means that there are many EU programmes which can provide additional funding and collaboration opportunities in the area of AI. Government will encourage Irish enterprises to participate in EU opportunities, for example, Important Projects of Common European Interest (IPCEIs) in areas such as cloud technology and cybersecurity, the AI4EU platform³⁹, and European Investment Bank funding for AI projects.

ENCOURAGING IRISH ENTERPRISE-LED COLLABORATION FOR AI

There are promising examples of enterprise-led efforts to increase collaboration on AI. For example, Ibec (the Irish Business and Employers Confederation) has launched an Artificial Intelligence Advisory Forum to help coordinate engagement on AI across enterprise policy areas and sectors. This Forum is also working to promote the opportunities presented by effective deployment of AI for enterprises, public services and wider society.

Local initiatives for collaboration on AI are also emerging around the country. There is funding in place to support this, for example through the Regional Enterprise Development Fund, administered by EI. There is also a competitive multi-annual fund of €2.75 million for Regional Technology Clustering available to Institutes of Technology (and Technological Universities).

39. The AI4EU platform acts as a broker, developer and one-stop shop providing and showcasing services, expertise, algorithms, software frameworks, development tools, components, modules, data, computing resources, prototyping functions and access to funding.

ENCOURAGEMENT OF CROSS-BORDER ENTERPRISE COLLABORATION ON AI

A *Border Enterprise Development Fund* administered by EI supports the international competitiveness of enterprises in the Border Region in the context of Brexit and other market challenges including COVID-19. Current projects focus on AI, robotics, machine learning, and big data. On a cross-border basis, InterTradeIreland (ITI) is exploring a range of internal digitalisation and data analytics projects to assist SMEs seeking to take their first steps with AI. ITI's Synergy Initiative can also provide seed funding for collaborative cross-border projects that leverage the use of AI and data-sharing in the development of all-island sectoral innovation ecosystems.

ENGAGEMENT WITH IRELAND'S GLOBAL TECHNOLOGY DIASPORA ON AI

There is potential to strengthen linkages with AI entrepreneurs and experts in Ireland's global technology diaspora, in order to facilitate collaboration, as well as transfer of knowledge and competence. Our diaspora holds invaluable expertise and insights into global trade, industry, innovation and investment opportunities and has long played a pivotal role in creating and deepening economic connections with Ireland. As part of *Global Ireland: Ireland's Diaspora Strategy 2020-2025*, Government will provide support for sector-specific Irish diaspora networks among research and innovation-related communities.⁴⁰

Objective

Increased productivity through a step change in AI adoption by Irish enterprise

Strategic Actions

- i. Establish an Enterprise Digital Advisory Board to advise and work with Government to drive industry adoption of AI and other digital technologies including by:
 - a. Assessing the current spectrum of AI resources available to industry from Government to inform actions to maximise the potential of the existing infrastructure
 - b. Developing an AI programme for enterprise of targeted funding and advisory measures for AI adoption
 - c. Raising awareness among businesses of all sizes of the resources available to help with AI adoption
 - d. Developing a national AI cluster or platform to drive collaboration between MNCs and SMEs [All actions above for DETE, EI, IDA, LEOs, SFI]
- ii. Consider the best model for a data and AI infrastructure platform to accelerate the onboarding and adoption of AI in industry [DETE/IDA/EI/DPER-OGCIO]
- iii. Establish an AI Innovation Hub, as part of Ireland's planned programme of European Digital Innovation Hubs, to act as a National First Stop for AI, providing expertise and guidance to enterprises on their AI adoption journey. [DETE, EI, Digital Europe].

40. Government of Ireland (2020), *Global Ireland, Ireland's Diaspora Strategy 2020-2025*, <https://www.dfa.ie/media/globalirish/Diaspora-Strategy-2020-English.pdf>

Strand 4:

AI Serving the Public

Objective

Better public service outcomes through a step change in AI adoption by the Irish public sector



4.1 Introduction

Government will leverage the potential of AI to assist in achieving excellence, innovation, and improved productivity in the delivery of public services and in other key activities. For example, AI applications can contribute to better public services by improving citizen-Government interaction, enabling smarter analytical capabilities and increasing efficiency. The OECD has estimated that in just a few years, the increasing use of AI in the public sector will offer the potential to free up nearly one-third of public servants' time, allowing them to focus on higher-value work.⁴¹

The GovTech Delivery Board, which is being established to drive digital transition in the public service, will lead on AI adoption in the public service. The Board will ensure a coordinated public service-wide, strategic approach to the implementation of AI, including the establishment of common methodologies and criteria and the creation of channels to facilitate collaboration and shared learning between public service organisations. Government will also aim to facilitate and stimulate AI innovation through the regulatory and policy environment and by using public procurement as a catalyst for ethical and innovative AI. Furthermore, the Public Service will aim to act as an exemplar of responsible AI innovation, building trust through the delivery of quality public services.

4.2 Enablers for AI in Public Services

DATA AND DIGITALISATION AS A FOUNDATION FOR AI IN THE PUBLIC SERVICE

AI is one part of a larger project to integrate digital services within Government, overseen by an ICT Advisory Board (chaired by the Government Chief Information Officer) and a Digital Leaders Group, which includes representatives from each Government Department. Significant work has already been undertaken by Government to advance the digitalisation of public services – from developing overarching strategies⁴² to investing in enabling infrastructures and technologies (e.g., National Broadband Plan, Public Services Card, MyGovID, Revenue Online Service, Digital Postbox). This means that many essential enablers for the AI strategy are already in place.

AI is dependent on good quality, interoperable, and standardised data. The legislative framework to underpin this is in place - the *Data Sharing and Governance Act (2019)* and the *Public Service Data Strategy (2019-2023)* set out how we can use data lawfully to empower and accelerate digital transformation within the public sector, while ensuring that data protection and people's right to privacy are protected.

41. OECD Working Papers on Public Governance No. 36, Hello, World! Artificial Intelligence and its Use in the Public Sector, November 2019.

42. For example, the Public Service ICT Strategy (2015) and eGovernment Strategy 2017-20

Connectivity, cloud computing⁴³ and data security are other prerequisites. These aspects, together with data-related considerations, are addressed in further detail in Strand 7. Government is also pursuing a proactive and progressive approach to embracing cloud computing, in recognition that cloud services represent an important method of obtaining the speed, transparency

and collaboration required to deliver a successful AI project.⁴⁴

All this foundational work places us in a good position to ensure a consistent and principled approach to the adoption of AI within the Public Service.

AI improves cycling infrastructure in Smart Dublin

Dublin City Council and Smart Dublin, through the SynchroniCity initiative (an EU project designed to accelerate adoption of new smart technologies), invited cyclists to take part in an innovative smart cycling project that connected 200 cyclists across Dublin City. The project ran simultaneously in two other cities, Antwerp and Manchester.

The project provided an opportunity for the Council to be more informed in its approach to planning and developing appropriate cycling infrastructure. Currently this requires physical observation, self-reporting, and anecdotal responses from members of the public to guide potential cycle infrastructure improvements.

The project participants received a See.Sense bicycle light and opted to share the data collected by these sensors with the project. The See.Sense bike light identifies over 800 sensor recordings per second and the data collected includes a mixture of sensor data (speed, road surface quality, swerving, heavy braking) as well as geolocated survey feedback shared via an in-app survey.

Over ten weeks from June to August 2019, the results highlighted the roads with the most challenging road surface quality for cyclists to ride through, while also allowing Dublin City Council's engineers to adjust plans for new cycle corridors based on the insights.



43. Cloud computing consists of a set of technologies and service models that focus on network-based on-demand use and delivery of IT applications, processing capability, storage and memory space.

44. The Cloud Computing Advice Note 2019 provides high-level guidance to assist public service organisations in making informed, risk-based decisions in relation to the adoption of cloud services. See Department of Public Expenditure and Reform, Cloud Computing Advice Note, October 2019. Available at: <https://assets.gov.ie/37039/4468be59812f40dda7003116cf05f196.pdf>

4.3 A Coordinated Approach to AI Adoption by the Public Service

AI is already being used across the public service, but to date its adoption has been somewhat fragmented. There are opportunities to scale the impact of AI in the public service through a coordinated approach to adoption, including the adoption of common methodologies and criteria and the creation of channels to promote collaboration and shared learning between public service organisations.

Government plans to establish a GovTech Delivery Board, which will lead the digital transformation of the public service. The GovTech Delivery Board will consider AI adoption in the public service as part of its work, providing strategic leadership and ensuring a coherent and cohesive approach by the public service in adopting AI as part of its toolkit for addressing societal issues. This work will be strongly aligned with the implementation of the *Public Service Innovation Strategy*, which has Transformative Innovation as one of its four Priorities.

Important issues which must be addressed by the Board include:

STRONG SECURITY TO UNDERPIN USE OF AI IN THE PUBLIC SERVICE

A vigilant approach to cybersecurity will be essential to successful adoption of AI and other digital technologies by the public service. With input, as appropriate, from the National Cyber Security Centre, the GovTech Delivery Board will consider what controls are appropriate to ensure a secure system for AI development and use in the public service, with input from the National Cyber Security Centre.

ETHICAL AND COMPLIANCE CONSIDERATIONS

Use of AI within the public service must be actively informed by an assessment of the potential human rights and equality implications and should also be carefully managed in accordance with privacy and broader ethical and legal frameworks. As outlined in Strand 2, it is essential that safeguards are put in place to address the risk of discrimination and bias in AI.

AI-enabled Government services should also incorporate adequate arrangements in terms of accountability and traceability, enabling ex-post verification. The public service can demonstrate a lead

in adopting and operationalising principles for the responsible and ethical use and governance of data and AI in the public sector. This can be achieved by promulgating standards and guidelines for ethical data sharing within the Public Service (Data Governance Board) and by adopting the AI Ethics Guidelines developed by the EU High-Level Expert Group on AI. Government will also consider options for conducting human rights and ethical impact assessments for AI in the public sector (covered in more detail in Strand 2).

The Board will develop, agree and publish principles for the responsible and ethical use and governance of AI, which will apply to all AI developed for and used by the Public Service. In collaboration with UCC, which is hosting an online tool to facilitate operationalisation of The Assessment List for Trustworthy Artificial Intelligence (ALTAI), developed by the EU AI HLEG, the Board will develop case studies as an example of how to operationalise Ethical AI Guidelines.

The design, development and procurement of AI-based technologies used for public services must also adhere to the statutory requirements on accessibility contained in the Disability Act 2005, the Web Accessibility Directive 2018 and the Public Procurement Directives 2016, as well as complying with universal design principles.⁴⁵

BUILDING AI SKILLS AND CAPACITY

The Board will consider the needs of the public service in terms of the development of AI talent. In order to build the skills, capacity and awareness needed for the successful adoption of AI in the public service, including an ability to assess the benefits and risks involved, it will also be essential to consider investment in programmes for the training and upskilling of existing public sector workers.

45. See guidance in the "Customer Communications Toolkit for the Public Service - A Universal Design Approach" published by the Centre for Excellence in Universal Design in partnership with the Department of Public Expenditure and Reform.

PROCUREMENT FRAMEWORK FOR AI IN THE PUBLIC SERVICE

Public procurement policy is an important potential driver of innovation and growth in the development and use of AI systems in Ireland. Furthermore, it can help stimulate demand and offer of ethical and trustworthy AI technologies. In its *Coordinated Plan on AI*, the European Commission has recommended that the public sector should lead the way in purchasing ethical and trustworthy AI applications by utilising public procurement policies as a strategic lever. To drive this, the Commission plans to initiate a programme called *Adopt AI* to support the public procurement of AI systems through collective purchasing power and open sectoral dialogues stimulating industry involvement.⁴⁶ Guidance is also available from the UK, which, together with the World Economic Forum, has developed a workbook of best practice and case studies addressing the specific challenges of acquiring AI technologies in government.⁴⁷

The GovTech Delivery Board will work with the Office of Government Procurement (OGP) to consider mechanisms for public procurement of AI which enable public purchasing power to act as a catalyst for the development and use of trustworthy AI. For example, in the area of cloud technologies, the OGP has recently published a *Cloud Services Procurement Guidance*

Note. Instruments such as dialogues, hackathons and pre-commercial procurement of innovative solutions will enable suppliers to respond better to public procurement requests, and also assist public authorities to understand the market better and formulate targeted procurements.

ENCOURAGING AI EXPERIMENTATION IN THE PUBLIC SERVICE AND WIDER ECOSYSTEM COLLABORATION

We will encourage collaboration between the Public Service and the wider economy and society to innovate in using AI to address societal problems. Shared solutions can be co-developed through mechanisms like innovation sprints, Challenge Funds and hackathons. A challenge-based approach to Open Data for AI will also be explored to understand how access to public sector data might help deliver positive and practical outcomes for AI use cases in different sectoral areas of focus.

Another way to develop AI solutions for the Public Service is through external partnerships. The GovTech Delivery Board will consider new models for working with AI experts from the private sector, as well as from academia/research communities. As an example, the *SFI Public Sector Fellowship* provides a vehicle for partnership between highly skilled academics and the public sector on AI-related projects.

Case Study: SFI Public Sector Fellowship Programme - Fostering Innovation within the Public Sector

The SFI Public Service Fellowship Programme was launched as a pilot in 2020, recognising the importance of connecting the Irish research community with public sector organisations to help inform new policy and improve the services that they deliver. With total grant funding in excess of €700,000, the Programme offers researchers a unique opportunity to be seconded to Government Departments, agencies and the Oireachtas Library and Research Services, to work on specific research projects.

The Fellowships awarded are specifically designed to foster innovation within the Public Sector by supporting the development and implementation of data-driven and evidence-based approaches. Fellowships can last between three and twelve months and projects offered by the hosts include a wide range of topics – including the economic, social and ethical implications of technological innovation; data analytics for signals of emerging food safety risks; the economic cost of discrimination and the benefits of diversity in the workplace. There is a strong emphasis on the use of AI to address the projects that will be carried out by the Fellows. In this context, a Fellowship has been awarded to a researcher from the ADAPT Centre, who will be hosted by the Houses of the Oireachtas Library and Research Service to conduct research on the economic, social and ethical implications of AI and Big Data.⁴⁸

46. EU White Paper on AI, action 6, p. 8.

47. UK Office for AI (2020), Guidelines for AI Procurement, accessed at <https://www.gov.uk/government/publications/guidelines-for-ai-procurement>

48. A full list of the 2020-2021 Fellows can be accessed at: <https://www.sfi.ie/research-news/news/harris-sfi-public-service/Full-list-SFI-Public-Service-Fellows-2020.pdf>

LANGUAGE TECHNOLOGY RESOURCES FOR AI IN THE PUBLIC SECTOR

Technologies such as Natural Language Processing (the ability to interpret human language, including translation) and speech recognition represent an important component of AI-based systems, for example, in the development of intelligent virtual assistants (e.g., Siri, Alexa, Google Assistant) and in analysis of

unstructured data. Many of the language datasets currently used for training AI systems originate from US-based sources and may not contain common everyday terms used by people in Ireland. To render AI systems accessible to a wider range of our population, as well as to develop services in Irish based on AI for Irish language-speakers, good language technology resources need to be developed.

Case Study: Developing Irish Language Technology Tools and Resources for AI

Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media (DTCAGSM) is currently funding a number of projects to promote the development of language technology tools and resources in Irish. For example, DCU has developed Irish language computer translation systems and a research project at Trinity College Dublin is developing an Irish language synthesiser - a system that can translate written text into language spoken in the different dialects (www.Abair.ie). A Digital Plan for the Irish Language is currently being prepared by these universities to underpin future technological opportunities.

There are also several machine translation projects ongoing with EU funding, including Irish participation in the European Language Resources Consortium and in the European Language Resource Infrastructure. One of the challenges in this area is obtaining sufficient amounts of language data within different domains, such as health, ICT and transport. Where possible, Government will promote awareness of Irish language data and resources in the public sector and co-operate on strategies to ensure that public sector language resources can be used for language technology purposes, where appropriate..

4.4 High Impact Sectors for AI in the Public Service

Deployment of AI systems within the Public Service is still in the early stages. Under this Strategy Government will drive the use of AI by the Public Service, aiming for targeted and transformative interventions. However, this will be dependent on the availability of good quality data. There are already numerous AI pilots and projects underway across the Public Service in areas ranging from health to agriculture, environment, revenue, customer service, smart cities and regions.

Some examples of high impact sectors for AI are outlined in this section, which is by no means exhaustive. The *EU AI High Level Expert Group* (AI HLEG) identifies several areas of opportunity within the public sector where it considers the adoption of AI to be of utmost importance for the well-being of society, as well as for enhancing sustainable growth - these are: the e-Government domain; Justice and law enforcement; and the Healthcare sector.⁴⁹ The European Commission is prioritising public sector dialogues on AI in healthcare, rural administrations and among public service operators,⁵⁰ and it has outlined the creation of data spaces in health, agriculture and transport.⁵¹

Irish Revenue AI voicebot helps citizens handle tax clearance

In early 2018, the Irish Revenue Commissioners initiated a pilot project to examine if AI-based Natural Language Processing (NLP) technologies could be used to deliver an improved customer service, reduce costs and increase efficiencies.

This resulted in the implementation of a Virtual Digital Agent (VDA), or voicebot, designed to focus on a subset of calls from the Irish taxpayer relating to tax clearance. A high proportion of these calls are reasonably repetitive and the knowledge required to provide suitable responses and positive experiences for customers is well understood.

A suite of integrated technologies was used to convert customer speech to text, understand the text using NLP so that a response could be formulated, and then convert this response back to speech so the customer could hear the answer. The Revenue demonstrated that voicebot technology can offer a fully automated service, providing an efficient, effective experience for customers. Below is a summary of some of the results:

- Up to 50% of calls were handled from start to finish by the voicebot
- 70% of first-time applicants engaged with the voicebot when submitting their application
- 75% of tax clearance holders were able to retrieve their tax clearance access number (TCAN)
- Only 10% of calls were transferred due to failure to understand.

The project won the award for the Best Use of Artificial Intelligence in Government at the 2019 CogX awards in London. However, one of the main challenges in extending beyond a pilot project is the requirement to implement a secure authentication model, suitable for these new technologies. The success of the project has encouraged the Revenue Commissioners to deploy this technology in future service offerings.

49. EU High Level Expert Group on AI, Sectoral Considerations on the Policy and Investment Recommendations for Trustworthy Artificial Intelligence, July 2020.

50. EU White Paper on AI, Action 6.

51. European Commission, Communication on A European Strategy for Data, February 2020. Also see EU White Paper on AI.

HEALTH SECTOR

Health is an area in which substantial potential benefits can be realised through the application of AI, for example in imaging procedures, decision-making, self-monitoring by patients and early detection of diseases. The COVID-19 pandemic has accelerated this trend. AI presents a particular opportunity to drive improvements in productivity and service within this sector in the context of constrained healthcare budgets and resources. Industry and academia (and increasingly frontline professionals) have already begun to recognise the potential benefits that AI can offer the health service in Ireland and there is significant R&I investment in the area. However, Ireland's *Competitiveness Challenge 2019* report identified medical sector digitalisation as particularly low in Ireland, compared to the EU average.⁵³

To underpin successful AI adoption in the health sector, elements to be considered include the availability of quality data (the health service remains predominantly paper-based), privacy and data security, risk, ownership of data, appropriate skills and resources, and health economics. Delivering a modern and responsive infrastructure is a core component of the ten-year *Sláintecare* programme and will involve consolidating and investing in data and R&I, rolling out the *Individual Health Identifier* and the *Electronic Health Record*, and developing a health information policy framework.⁵³

Patient information, medical records, diagnostic results, and clinical studies are just a few of the data sources available in this area. *The Health Research Regulations (2018)* provide for the processing of identifiable data for the purposes of health research, to ensure that patients maintain confidence and trust that their information is used in a sound, ethical and secure manner. The Department of Health is also advancing a National Research Ethics Committees Bill which will set out a framework for establishing National Research Ethics Committees (RECs) in certain areas, which may include genomics and AI.

JUSTICE SECTOR

The *EU e-Justice Strategy and Action Plan 2019-2023* identifies the use of AI as a priority area in the justice field. Administrations around the world are exploring how AI can be used to support the work of legal professionals, courts and law enforcement officials. Automated decision-support tools can yield increased fairness and efficiency for judicial systems. For example, algorithmic risk assessment tools can be used to inform decisions about pretrial detention, sentencing, and bail, with the potential to improve consistency and predictability.

However, the use of AI within the justice sector also has considerable implications for ethics, human rights and the rule of law. The Council of Europe has developed an *Ethical Charter on the use of AI in judicial systems and their environment*. This charter identifies the following areas as lower risk and best suited to the early adoption of AI technologies: the development of case law by linking doctrine, case law, laws and regulations; the determination of compensation awards; and on-line dispute resolution.⁵⁴

AI can provide new tools and insights for policing and law enforcement. The principal areas of AI application in this field include predictive policing, and the gathering and analysis of evidence. Under *An Garda Síochána's Digital Strategy 2019-2023*, digital policing is evolving rapidly with innovations emerging around AI and robotics. The EU has highlighted human rights and ethical considerations as paramount when considering the use of AI in the context of law enforcement and Ireland is actively involved in discussions regarding the future EU framework in this area.⁵⁵

52. National Competitiveness Council, Ireland's Competitiveness Challenge 2019, December 2019, p.17.

53. Department of Health, *Sláintecare Implementation Strategy*, 2018. Available at: <https://assets.gov.ie/22607/31c6f981a4b847219d3d6615fc3e4163.pdf>.

54. European Commission for the Efficiency of Justice (CEPEJ), *European Ethical Charter on the Use of Artificial Intelligence in Judicial Systems and their environment*, December 2018, accessed at: <https://rm.coe.int/ethical-charter-en-for-publication-4-december-2018/16808f699c>

55. See for example Council of Europe (May 2019), 'Unboxing Artificial Intelligence: 10 steps to protect Human Rights', recommendation no. 6, p. 11.

AGRICULTURE SECTOR

Agri-Digitalisation policy in Ireland is led by the Department of Agriculture, Food and the Marine. The *Teagasc Technology Foresight 2035* report highlights several key technologies, including AI and robotics, as priorities for research and innovation to ensure a sustainable agriculture sector. In 2019, Ireland signed a joint EU declaration on *A smart and sustainable digital future for European agriculture and rural areas*, promoting a comprehensive approach towards digitalisation in this sector, including an important role for AI.⁵⁶

AI-powered solutions and robots can support farmers, for example, in livestock production and ensuring animal welfare, breeding, harvesting crops, and significantly reducing the use of inputs such as fertilisers, pesticides or irrigation water, thus leading to significant economic and environmental benefits. The availability of data, both generated by the increasing digitalisation of agriculture, as well as data from earth observation or climate data, is an important enabler for the acceleration and development of AI-based solutions in this domain. The use of AI technologies will also play an important role in modernising the EU Common Agricultural Policy (CAP).

Case Study: Common Agricultural Policy Modernisation through use of AI

The Area Monitoring System (AMS) is an example of how the use of new innovative technologies can aid in modernising the agricultural sector. AMS is defined as the regular and systematic observation, tracking and assessment of agricultural activities and practices on agricultural areas by Copernicus Sentinel Satellite data, or other data with at least equivalent value. To facilitate the implementation of the AMS, which will be compulsory in the Common Agricultural Policy (CAP) post-2020, a phased introduction is being implemented by Ireland for various schemes over the interim period.

The first phase will see Checks by Monitoring (CbM) being used for the Protein Aid Scheme in 2021. Checks by Monitoring is an automated and continuous process which will use data from Copernicus Sentinel satellites, along with other data sources, to determine the agricultural activity on all land parcels declared by farmers under the Protein Aid Scheme in 2021. CbM allows the monitoring of the whole population of aid recipients, rather than focusing on checks of a sample of farmers. Currently, in order to verify farmers' declarations and adherence to eligibility rules, paying agencies have had to carry out field inspections for a sample of around 5% of farmers. Under this approach, all agricultural parcels are subject to the same monitoring process.

The use of Copernicus Sentinel data and other technologies for monitoring area aid can have significant potential benefits for farmers and administrations. The CbM approach can take new information into account at any time during the growing season (such as newly acquired, more recent Sentinel data, geo-tagged photos, or other documents sent by the farmer), and it therefore provides more opportunities for farmers to rectify their claims. Warning notifications can also be issued to farmers, giving them the opportunity to amend their claim accordingly. The monitoring approach can help to reduce the number of non-compliances.

56. <https://digital-strategy.ec.europa.eu/en/news/eu-member-states-join-forces-digitalisation-european-agriculture-and-rural-areas>

Objective

Better public service outcomes through a step change in AI adoption by the Irish public sector

Strategic Actions

- i. The GovTech Delivery Board will consider the adoption of AI by the Public Service, including:
 - a. What appropriate safeguards are needed to ensure a secure system for AI development and use in the public service
 - b. The approach to developing and promulgating principles for trustworthy AI which will apply to all AI developed for and used by the Public Service
 - c. The development needs for AI talent in the Public Service
 - d. Opportunities for public procurement of AI, using public purchasing power to drive innovation and growth in the development of ethical and trustworthy AI
- ii. Promote an 'open' environment for accelerating and testing AI applications in the Public Service, e.g. Hackathons and Workshops [DPER]

Strand 5:

A Strong AI Innovation Ecosystem

Objective

A strong Irish ecosystem for high-quality and responsible AI research and Innovation



5.1 Introduction

Ireland has a strong innovation landscape of entrepreneurs and agile innovation businesses. Many of our academic researchers are internationally renowned for their excellence in AI and sit on influential international committees and working groups relating to AI research, development and governance.

In addition, we have built a strong ecosystem for industry-academic research through purpose-built programmes such as the SFI Research Centres, SFI Industry Fellowships and SFI Strategic Partnership Programmes. Ireland ranks highly in a number of global AI indices and is also recognised as an important centre of activity and talent in the analysis and use of data, which is a key factor in the development of AI.⁵⁷ Ireland was ranked sixth in the EU Digital Economy and Society Index (DESI) in 2020, reflecting our high level of digital competitiveness.⁵⁸ In terms of per capita expenditure on investments in AI, Ireland ranks in second place within the EU.⁵⁹

Under this strategy, these strategic advantages will be leveraged to build a leadership position in AI. Government will develop a supportive ecosystem along the entire AI value chain, promoting strong links between industry, research, and academia, so that innovative researchers, enterprises and entrepreneurs that are involved in developing and using AI are connected both to each other and to appropriate support systems. Government will aim to create the optimum conditions and incentives to accelerate the adoption of AI-based solutions, including by start-ups and SMEs. International cooperation and embracing all-island opportunities will also be fundamental for bringing Irish AI research and innovation (R&I) to the forefront.

57. In 2020, Ireland ranked twelfth in the Global AI Index. See <https://www.tortoisemedia.com/podcast/global-ai/>

58. EU Digital Economy and Society Index 2020, <https://ec.europa.eu/digital-single-market/en/desi>

59. AI Watch (2020), Estimating Investments in General Purpose Technologies: The case of AI Investments in Europe, European Commission Joint Research Centre p. 17

5.2 A Strong R&I Ecosystem for AI

Ireland has made successful strategic investments in AI R&I, as well as related technology areas over the past fifteen to twenty years, leading to global recognition for a number of our AI researchers and centres. With the aim of enhancing Ireland's reputation as a leader in AI innovation, Government will continue to develop actions to build on our current strengths in these areas and foster a strong ecosystem.

INTEGRATING AI ACROSS R&I POLICIES

The new National Strategy for Research and Innovation which is being developed in 2021 will include objectives for AI-related R&I, as one of Ireland's research priorities within the area of ICT.⁶⁰ It will also recognise the importance of embedding AI, and digitalisation more broadly, within other sectoral research areas and strategies.

SUPPORTING AI R&I ACTIVITIES

SFI currently supports AI R&I across its network of SFI Research Centres, as well as in its SFI Centres for Research Training, several of which are dedicated to areas directly related to AI.

Through its Strategic Partnerships Programme with industry, SFI also supports CONSUS, a €17.6 million five-year strategic research programme in the area of digital agriculture which includes the use of machine learning to generate actionable insights for the market. Pioneering research in AI is also ongoing at other institutions. For example, the Technological University Dublin (TU Dublin) was awarded €4.1 million Marie Curie funding to conduct research on health and safety in AI.

A SUPPORTIVE FUNDING ENVIRONMENT

The competitiveness of the Irish AI R&I ecosystem will be secured with appropriate funding for research activities. Importantly, there will be an emphasis on basic research which will underpin our future competitiveness in AI, as well as on applied research. Research funding schemes, and associated metrics and targets will be reviewed to ensure that the balance between basic and applied research is correct.

One example is the Disruptive Technologies Innovation Fund (DTIF) - a €500 million fund established under Project Ireland 2040. To date, through the DTIF, twelve

AI-related projects have been funded to a value of almost €45 million. Projects range from health-related applications of AI to technology, gaming and creative industries. Government will encourage further AI-related applications in future DTIF funding calls.

European Funding Opportunities

The European Commission has already invested €1.5 billion in AI research and innovation under the *Horizon 2020 programme*. AI maintains a prominent place in the EU's new framework programme for research and innovation, *Horizon Europe*, running from 2021-2027, as well as in the *Digital Europe Programme 2021-27*, which is intended to generate €20 billion per annum in combined public and private funding.

The EU Coordinated Plan on AI envisages a number of actions to promote research transfer from the lab to the market. These will provide funding possibilities and opportunities for Irish researchers to deploy the results of their research directly in the market, including through:

- Building networks of *European AI Research Excellence Centres*
- Establishing world-class reference testing facilities for AI
- Accelerating AI take-up through a network of *European Digital Innovation Hubs* (EDIHs) which may be attached to research facilities and are intended to drive SME uptake of AI

The Government will aim to develop synergies with the European AI Research Excellence Centres and differentiate our expertise according to specific sectors of national strategic interest. Ireland is also keen for its research facilities to play a part in the network of future EDIHs, which will help facilitate AI diffusion by providing access to technologies and other resources to SMEs to understand and adopt AI.

60. The Department of Business, Enterprise and Innovation, National Research Prioritisation 2018-23, accessed at: <https://dbe.gov.ie/en/Publications/Research-Priority-Areas-2018-to-2023.html>



CONNECTING WITH INTERNATIONAL PARTNERS AND PROMOTING IRELAND AS A CENTRE FOR GLOBAL TALENT IN AI R&I

The Irish AI innovation ecosystem must be able to actively connect with international AI expertise and networks. Ireland currently has five European AI (EurAI) fellows⁶¹ (the highest number per capita in the EU) and Irish researchers are active in both international and European AI R&I consortia. Building on this success, the ADAPT Centre, together with Dublin City University (DCU), has taken the initiative to lead a national multi-stakeholder AI research, technology and innovation hub with the aim of expanding Ireland's international influence in these areas. Irish third-level institutions will continue to develop programmes and cooperation with leading international AI research hubs and institutes, as well as exploring partnerships in the training of AI experts, e.g., via PhD and fellowship programmes. The State will also promote Ireland as a global centre for AI R&I talent.

CROSS-BORDER COLLABORATION ON AI R&I

There is potential to explore opportunities for cross-Border cooperation in the area of AI R&I. For example, through the Shared Island Fund, the Government is making €500 million in new capital funding available out to 2025, in order to foster new investment and development opportunities on a North/South basis. Potential projects relevant to AI include “a North-South programme of research and innovation, including an all-island research hub, through Universities Ireland”; North-South health links and an “all-island strategy to tackle climate breakdown and the biodiversity crisis.”⁶²

61. The EurAI Fellows programme recognises researchers who have made exceptional contributions to the field of AI in Europe - <http://www.eurai.org/member/>

62. <https://www.gov.ie/en/press-release/2c97f-taoiseach-statement-on-shared-island-fund/>

5.3 Strengthening AI Ecosystem Collaboration

Continued and increased interaction and collaboration between research and industry will be key to achieving Ireland's ambition to build a leadership position in AI innovation. Government will build on existing incentives targeted at promoting and financing collaborations on AI innovation between large enterprises, SMEs, and research institutions to diffuse the spread of innovation and create new business opportunities. Key enablers include mechanisms for the mobility of researchers, e.g., SFI fellowships to promote industry-academia collaboration, as well as the availability of datasets for collaborative projects and for development and testing of new use cases. Some of the current mechanisms and platforms for encouraging collaboration on AI between industry and research, as well as with the public sector are outlined in Box 1.

Box 1. Mechanisms and platforms for encouraging collaboration between researchers and enterprise

- The **Technology Centre programme**, a joint initiative between EI and IDA Ireland (IDA), allowing indigenous businesses and multinational enterprises (MNEs) to work together on market-focused strategic R&I projects in collaboration with research institutions. Of particular importance for AI is CeADAR, the National Centre for Applied Artificial Intelligence.
- IMR – the Irish Manufacturing Research Centre - works with the manufacturing industry to demystify, derisk and deliver emerging technologies and new knowledge, such as AI, enabling industry to succeed at the cutting edge of advanced manufacturing.
- The **Irish Research Council's Enterprise Partnership Schemes**, which link researchers to businesses.
- The **SFI Industry Fellowship (IF) Programme**, which enhances industry-academia collaborations by funding collaborative research projects and stimulates excellence through knowledge exchange and training of engineers and scientists ("researchers"). SFI also launched a Public Service Fellowship Programme as a pilot initiative in 2020, awarding an AI Fellowship to researching the economic, social and ethical implications of AI and Big Data.
- The **SFI Frontiers for the Future Programme**, which provides opportunities for independent investigators to conduct highly innovative, collaborative research with the potential to deliver impact, whilst also providing discrete opportunities for high-risk, high-reward research projects.
- The **Technology Gateway Network**, run by EI in partnership with nine Institutes of Technology around the country and TU Dublin, which delivers technology solutions for industry close to their market needs and acts as local access points to the wider resources in the Irish research infrastructure.
- **Knowledge Transfer Ireland**, funded by EI, with co-financing from the Irish Universities Association and participation by IDA and SFI, is a national office that helps enterprises benefit from access to State-funded technology, ideas and expertise by making it easy to connect and engage with the research base.

A SUPPORTIVE PILOTING ENVIRONMENT

Government will promote policies to assist an agile transition from the AI R&I stage to deployment and implementation. Bringing state-of-the-art AI applications to the market requires experimenting and testing in real-world environments.

A testing and experimentation platform - or development environment - for conducting rigorous, transparent, and replicable testing is a critical enabler for AI innovation because of the need to demonstrate trustworthiness and to deploy in complex digital and physical environments.

Another related enabler is 'regulatory sandboxes', a framework set up by a regulator that allows researchers and innovators to conduct live experiments in a controlled environment under a regulator's supervision.

Ireland offers an ideal testing and experimentation platform or 'testbed'⁶³ for AI due to our indigenous technology base and the density of connections afforded by our size and infrastructure. Three examples of existing testbeds are:

- CONNECT, the SFI Research Centre for Future Networks and Communications operates a number of testbeds - for example an Internet of Things (IOT) testbed

- CONFIRM, the SFI Research Centre for Future Manufacturing, provides testbed facilities for future manufacturing.
- The Blended Autonomous Vehicles programme, led by the Lero, SFI Research Centre for Software, provides an opportunity for academic researchers, and global and indigenous automotive firms, to collaborate on key challenges facing the development of driverless vehicles, including the provision of testbed facilities.

Building on existing facilities, relevant agencies will identify particular sectors of opportunity for AI testbeds, considering the specific needs of SMEs, as well as particular geographic areas, and ensuring that testing resources remain responsive to commercial and public interests.

The European Commission has proposed a dedicated budget for world-class *Reference Testing and Experimentation Facilities* (RTEF), with sectoral priorities in the areas of Health, Agri-food, Manufacturing, Smart mobility / Smart cities & communities, including IoT and Data Ethics. Opportunities to draw down on this funding as well as to assist researchers to engage with RTEF facilities established in other Member States will be examined.

Making Open-source software for AI development by Irish researchers and enterprise

Open-source software is a term for software released under a license that allows users to access, study, change, and distribute the software to anyone and for any purpose, allowing for development of AI in a collaborative public way. Open-source platforms for AI (e.g., *TensorFlow* and *Keras*) offer a wide range of free building-tools, machine-learning libraries, and resources that simplify, streamline and standardise AI development in designing algorithms and intelligent applications. Such platforms offer transparency and security, thereby improving trust through greater visibility of data management and the predictive modelling processes.

SFI funded Research Centres - *LERO*, *CONNECT*, *INSIGHT* and *VistaMilk Research Centres* – are driving a number of Irish Open-source software projects with tens-of-thousands of international downloads..

63. The term 'testbed' is used across many disciplines to describe experimental research and new product development platforms and environments.

Objective

A strong Irish ecosystem for high-quality and responsible AI research and Innovation

Strategic Actions

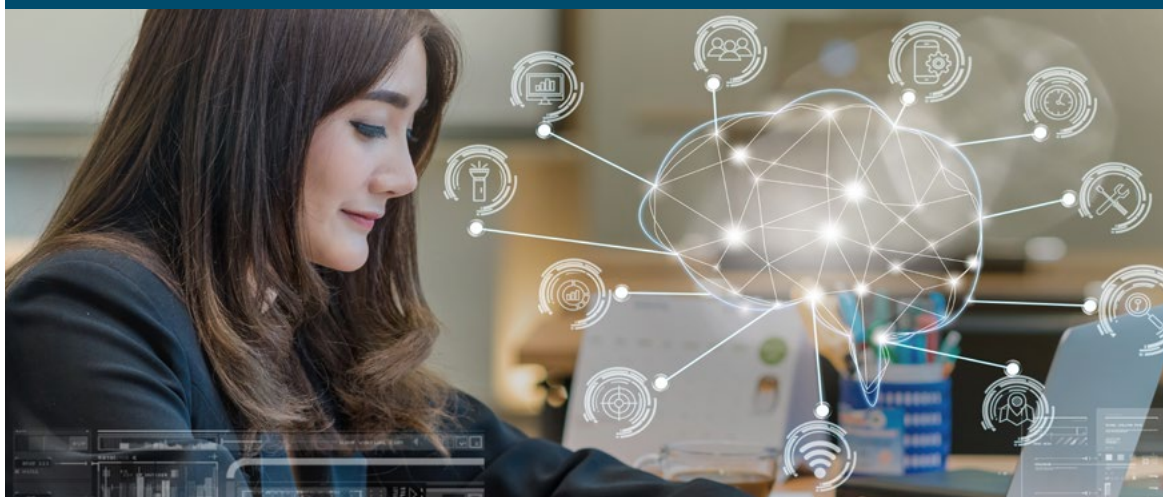
- i. Conduct a mapping of the AI R&I ecosystem [DFHERIS-SFI]
- ii. Identify sectors of opportunity for establishing AI testbeds and experimentation facilities [DETE, EI, IDA & NSAI / DFHERIS, SFI, Enterprise AI Advisory Board]
- iii. Promote Irish participation in international AI R&I programmes and relevant EU funding calls [DFHERIS, SFI/ DETE]
- iv. Explore potential mechanisms for all-island cooperation on AI R&I in strategic sectors, for example through the Shared Island initiative [DFHERIS, SFI/ DoT]
- v. Promote Ireland as a centre for talent in AI R&I as part of Global Footprint 2025 [DFHERIS/ DETE/ DFA]

Strand 6:

AI Education, Skills And Talent

Objective

A workforce prepared for and adopting AI



6.1 Introduction

AI and other digital technologies are transforming the world of work. By some estimates, one in three jobs in Ireland is at risk of being disrupted by the adoption of digital technologies and automation. This has raised concerns about the possibility of technological unemployment, as well as a possible downwards impact on the wages of workers most at risk of being displaced. However, it is anticipated that much of the disruption caused by AI will result in changes to job roles, tasks and distribution, rather than actual job losses.⁶⁴ AI can also augment and enable the work we do, creating new job opportunities that require the skills and willingness to work alongside AI-based systems.

Our workforce must be prepared for this technological change, and Ireland must be in a position to fully leverage the opportunities offered by AI for innovation, productivity and societal value. Having the appropriate policies in place to develop, attract and retain AI talent will be crucial to the success of AI in Ireland. Equally, Government will prioritise policies that ensure workers can access opportunities to upskill or re-skill in order to adapt to the changes in the labour market.

This Strategy sets out a roadmap to ensuring that Ireland has a future-oriented workforce and population with the skills to drive the development, deployment and use of AI to increase productivity and benefit society. This will be done by teaching digital and technical skills in the primary and post primary education system, by delivering further and higher education programmes tailored to address AI skills needs, by creating the conditions to attract and retain International talent, and by promoting gender balance and diversity in the AI workforce.

64. Expert Group on Future Skills Needs, Digital Transformation: Assessing the Impact of Digitalisation on Ireland's Workforce, December 2018

6.2 AI and the Future of Work

The growth in the capabilities and applicability of AI and other technological changes has raised public concerns about potential job losses as well as a possible downwards impact on the wages of the workers most at risk of being displaced. This is not a debate that is new; going right back to the invention of the steam engine, there have been concerns that machines would replace people. In principle, the effect of new technologies such as AI on employment reflects the outcome of two forces; one, a negative substitution effect where jobs or component tasks are displaced through automation; and a second positive complementing force that raises the demand for work elsewhere. In the past, the second effect has won out; automation has generated new work through making existing workers more productive, by raising productivity and overall incomes in the economy (often referred to as the “bigger-pie” effect) and by creating new kinds of work. As regards the latter effect, one analysis based on US data shows that in 2018, 63% of jobs in new occupational titles had not been “invented” as of 1940.⁶⁵

On balance, the lessons of history suggest that AI, like earlier general-purpose technologies, will not mean the end of work or anything like it; the recent MIT Task Force on the Work of the Future concludes that “no compelling historical or contemporary evidence suggests that technological advances are driving us towards a jobless future”. That said, as with other technologies, the adoption of AI will create winners and losers and the challenge for policy will be to ensure that the benefits from the jobs of the future are shared by all workers.

Recent studies have shown a rapid increase in the deployment of AI technologies throughout the economy and some early indications reflect a potential for AI to substitute for humans in certain tasks.⁶⁶ One effect of the COVID-19 pandemic may be the faster adoption of AI and other automation technologies including in work areas marked by high physical proximity.⁶⁷ More generally, unlike previous technological advances, which often led to the automation of jobs that involved routine tasks, AI is increasingly being applied to non-routine tasks in areas such as legal writing, medical diagnostics and driving of vehicles.⁶⁸ Much of the additional job growth is likely to be in areas that require human-technology collaboration and domain expertise, such as managing data, working effectively with technology tools and applications, and identifying efficiency improvements.⁶⁹ The development of non-technical skillsets will be equally important to ensure we can effectively apply, manage and regulate AI.

Skills policies will need to be combined with other interventions, including social protection and social dialogue, in order to protect workers’ interests and ensure that increasing use of AI in the workplace does not serve to deepen inequalities.

Given the scope of its impact, predicting the exact labour market impacts of AI in Ireland is not possible at present. However, we can expect to see a range of consequences across skill demands, hiring rates, employment and earnings. The Expert Group on Future Skills Needs (EGFSN) is conducting a review of the skills implications of AI over the next five to ten years, focusing on the deployment, management and regulation of AI, and the skills-related actions needed to realise the opportunities and potential of AI. The EGFSN will deliver a report on this work by the end of 2021.

65. Cited in MIT Task Force on the Work of the Future, 2020.

66. Acemoglu, D., Autor, D., Hazell, J., and Restrepo, P. (2021). ‘AI and Jobs: Evidence from Online Vacancies’ (NBER Working Paper No. 2857). National Bureau of Economic Research.

67. McKinsey Global Institute, The future of work after COVID-19, February 2021.

68. Addressing Employment Vulnerability as Part of a Just Transition in Ireland No.149 March 2020, National Economic and Social Council

69. World Economic Forum (2020), Future of Jobs, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf

6.3 Building Digital Skills for AI as part of the Education Curriculum

The EU Digital Education and Action Plan 2021-7 integrates specific actions for the improvement of AI-related skills into the larger context of promoting digital skills. In Ireland, our policy on embedding digital skills and technologies within school teaching, learning and assessment is outlined in the *Digital Strategy for Schools 2015-2020 Enhancing Teaching, Learning and Assessment*, with a follow-on to this digital strategy currently under development.

Ireland also has a *STEM Education Policy Statement 2017-2026* which aims, *inter alia*, to achieve and improve the STEM education experience and outcomes for all learners at Early years, Primary and Post-Primary level. A computer coding module has been introduced at Junior Cycle level, and national rollout of a new specification for Leaving Certificate Computer Science commenced in September 2020. Key complementary skills such as communication, creativity and working with others are also embedded throughout the primary and post primary curricula. AI is a developing area so curricula must continue to evolve to ensure that children are being taught the skills they will need to engage confidently and effectively with AI in the future.

It is also important that teachers understand the strengths and limitations of AI as part of teaching methods - how AI can augment learning, but also the ethical considerations and risks involved. AI-based educational tools may bring benefits such as the ability to provide customised learning and personalised feedback, as well as enabling distance education for children in remote regions and specialised products that can assist non-traditional learners and children with diverse needs. Importantly, since our children will experience the greatest impact of AI, their use in schools can build familiarity and ease with AI solutions from an early age.

The Department of Education already assists schools to embed the effective use of digital technologies in teaching and learning practices and to develop digital literacy through the provision of a broad range of Continuous Professional Development initiatives. The School Excellence Funds for Digital and STEM provide some €1m funding to schools working in clusters on innovative projects using digital technologies in teaching and learning, some of which include the use of robotics and coding. The Irish Universities Association is also engaged in a three-year project called '*Enhancing Digital Teaching and Learning*', funded by the Higher Education Authority's (HEA) Innovation and Transformation programme.⁷⁰

Case Study: AI-based Dementia App

Memory Haven

Developed by three Irish secondary school students, the Memory Haven app won the top prize in the senior girls' division at the 2020 virtual Technovation World Summit (an annual global AI and mobile app competition that encourages girls to tackle community issues through technology).

Memory Haven is designed to help the more than 500,000 people in Ireland whose families have been impacted by dementia, by helping them with memory loss challenges such as recognising friends and relatives, as well as with communicating their needs through speaking. Influenced by research demonstrating that musical memories can comfort people with dementia, the app incorporates AI-driven music playlists based on user emotions, along with healthcare features such as alerts, face and voice recognition, and health checks. The patient's doctor, once given access, can also easily view patient details, chat with the patient and schedule appointments. The app incorporates a 'Memory Game', allowing the patient to test and improve their cognitive abilities, as well as a remote monitoring feature for relatives or caregivers.

The winning students, Rachael and Margaret Akano (Sacred Heart Drogheda) and Joy Njekwe from (Our Lady's College in Greenhills, Drogheda), developed the app under the mentorship of tech expert Evelyn Nomayo, a PhD research fellow in Trinity College and founder of Phase Innovate, a not-for-profit organisation dedicated to bridging the gender and race gap in STEM fields in Ireland. The app is expected to launch in Ireland, Europe, the US and Africa, with Evelyn as main developer and Microsoft for Startups Europe as the technical support team.

70. Irish University Association press release on 7 November 2019 accessed at: <https://www.iua.ie/press-releases/iua-launches-initiative-to-enhance-digital-learning/>

6.4 Building AI Skills

The future of high-quality research and innovation in AI, both in academic and industry settings, depends on the availability of people with the right skills and abilities to understand and innovate in this field. Ireland's responsive skills architecture, which includes a strong emphasis on building technology skills, will play a key role in this regard.

The National Skills Strategy 2025 – Ireland's Future includes actions to build technology skills such as increasing participation in STEM (Science, Technology, Engineering and Maths) education; teaching ICT skills to students at all stages; and the development and rollout of ICT related strategies for Higher Education (HE) and Further Education and Training (FET). The Strategy also outlines a focus on '21st century skills,' referring to skills such as communications, resilience, creativity and problem-solving as examples. *Technology Skills 2022: Ireland's Third ICT Skills Action Plan* sets out priority actions to meet the demands for high-level ICT skillsets in the Irish economy.

Various education and training measures are also helping to ensure that providers can collaborate with, and respond quickly to, industry needs in the area of AI. Higher Education Institutions, through initiatives under Springboard+ and working with Skillnet Ireland, have partnered together with industry to develop programmes in AI including:

- MSc in Artificial Intelligence - University of Limerick (with Technology Ireland Skillnet)
- MSc in Computing - Artificial Intelligence (online) - Dublin City University and National University of Ireland Galway (NUIG) (with Technology Ireland Skillnet)
- Certificate in Artificial Intelligence (NFQ L8) – Institute of Technology Tralee (Springboard+)
- MSc in Software Design with Artificial Intelligence (NFQ L9) – Athlone Institute of Technology (Springboard+2020)
- Postgraduate Certificate in Software Design with Artificial Intelligence (NFQ L9) – Athlone Institute of Technology (Springboard+2020)
- Higher Diploma in Artificial Intelligence (Concepts and Applications) (NFQ L8) – CCT College Dublin

(Springboard+2020)

- Graduate Certificate in Artificial Intelligence (NFQ L9) – Dublin City University (Springboard+2020)
- Certificate in Automotive Artificial Intelligence (NFQ L9) – IT Sligo (Springboard+2020)

Furthermore, one of the objectives of the *Human Capital Initiative*, launched by the Department of Education in 2019, is to increase higher education capacity in skills-focused programmes designed to meet priority skills needs, including the future-proofing of graduates with industry-relevant skills for emerging technologies, including AI.⁷¹ New undergraduate places and graduate conversion courses have been developed to meet areas of identified skills needs. A Higher Diploma in Science in Computing (Artificial Intelligence/Machine Learning) at the National College of Ireland and a Higher Diploma in Artificial Intelligence at CCT College Dublin have received funding under this initiative.

Interdisciplinary skills are also important to build awareness of AI as a useful tool across disciplines - basic AI knowledge and AI-related education modules should therefore form a part of third-level curricula across disciplines. Not just in computer science, but also in the other sciences, as well as in the arts and humanities, where appropriate.

SOLAS, Ireland's Further Education and Training Authority, is embedding core digital skills throughout its training provision.⁷² Examples include the *Skills to Advance* and the *Skills to Compete* schemes. Delivered through the Education and Training Boards, these schemes aim to assist employees and SMEs in adapting to changes in work practices and technologies, especially vulnerable groups and those with lower skills levels. Skillnet Ireland's Digital Skills Initiative also seeks to equip managers, especially within SMEs, with the know-how to manage digitalisation.

There are also a number of initiatives aimed at addressing deficiencies in digital skills in the older workforce. One example is the EXPLORE programme, designed to address the need for enhanced transversal and digital skills among persons over 35 years of age in the manufacturing, logistics and supply chain and hospitality sectors.

71. <https://hea.ie/skills-engagement/human-capital-initiative/>

72. Technology Enhanced Learning in Further Education and Training 2016-2019, SOLAS

Furthermore, Government will aim to raise the level of digital skills amongst the general public. A new ten-year strategy for Adult Literacy, Numeracy and Digital Literacy is currently in development by SOLAS, with input by relevant Government Departments and agencies and in consultation with key stakeholders. This is in addition to the existing strategy for Literacy, and Numeracy (including Digital Literacy) to 2020 for Early Years and schools. Development of a new Literacy, Numeracy and Digital Literacy strategy for Early Years and schools is underway. The aim of both

new strategies is to ensure that everyone has adequate literacy, numeracy and digital literacy skills to meet their needs and participate fully in society.

A significant gap continues to exist in terms of producing industry-ready AI graduates, with the ability to apply their skills directly to real-world AI research and to business problems in various domains. To address this, SFI has developed a Centres for Research Training programme, which is supporting the training of post-graduate students in several areas related to AI.

Case Study: SFI Centres for Research Training

SFI Centres for Research Training (CRT) – a training programme for postgraduate students in “Data and ICT skills for the future”

The SFI CRTs represent a €104 million investment from SFI and use a cost-share model where, at minimum, one out of every five students is funded from leveraged non-SFI sources. Collaborations include eleven different HEIs from across Ireland, and over 90 industry partners which include MNEs, SMEs and private foundations. SFI’s vision for this programme is to train and develop future leaders, who will have interdisciplinary and intersectoral skills which will benefit Ireland’s economy and society, through digitalisation, data science, machine learning and the application of AI.

The SFI CRTs programme aims to provide students with world-class, cohort-based, interdisciplinary training within environments of research excellence. This significant investment will expose students to the wider scientific relevance of their research, encourage peer-to-peer learning and facilitate the establishment of networks that will enhance their research, employability and leadership potential. Students will be equipped with transversal skills including entrepreneurship and innovation to enable them to adapt and react to rapidly evolving workplaces. Career support available to postgraduate students includes research skills, transversal and cross-sectoral skills, discipline-specific skills, as well as placements in industry and overseas academic labs.

The six SFI CRTs is providing training for postgraduate students in the areas of Machine Learning, Digitally Enhanced Reality, Foundations of Data Science, Genomics Data Science, Artificial Intelligence and Advanced Network for Sustainable Societies. 46% of students under this programme are female, showing the significant impact that this investment will have on the number of AI-trained female professionals in the future.

Sector specific initiatives include a PhD internship programme in AI and data science run by Met Éireann to address problems of interest to the meteorological community.

6.5 Attracting and Retaining International AI Talent

Government wants to leverage Ireland's reputation as a 'tech hub' to become an attractive destination for AI-related employment and innovation. Ireland succeeds in attracting more AI talent than the rest of Europe, proportionate to population size, and is one of four EU member states with a higher percentage of AI workers with undergraduate degrees than the US.⁷³

National policy is to drive skills availability through the education and skills system. However, where a shortage of critical skills has been agreed, the employment permits system plays a supporting role in ensuring the Irish economy can adequately service its skills needs – including those skills in AI.

Implementation of the recommendations of the September 2018 *Review of Economic Migration Policy*, conducted by the Department of Enterprise, Trade and Employment, will also be important in generating a more accommodating environment for inward migrants under the employment permits system. In particular, the liberalisation of restrictions around spousal working rights should help boost initial attraction and retention.

This can be a virtuous cycle, with world-leading AI researchers in Ireland acting as magnets for enterprises and other academic researchers. SFI has already successfully attracted leaders in the AI field to Ireland through its SFI Research Professorship Programme.

6.6 Women's Participation in AI

As careers in AI tend to be well-remunerated, they represent an area of opportunity and rapid growth potential. However, three quarters of workers in AI and data science (in Ireland and Internationally) are men.⁷⁴ The EU AI HLEG has emphasised the need to increase the proportion of women in science and technology to improve the relevance and quality of research and innovation in AI systems, as well as to fully leverage the talent pool.⁷⁵

There are positive signs with respect to the pipeline of future AI workers in Ireland - 21% of ICT students are female in Ireland, placing us above the EU average of 17.7%.⁷⁶ TechIreland data also indicates that 21% of the indigenous (self-described) AI businesses they track in Ireland are female-founded.⁷⁷ However, these are still very low proportions. In addition, the retention rate of women in the STEM sector is lower than that of men.

Ireland is committed to achieving improved gender balance in AI. There are already initiatives in place to encourage women into AI careers. Skillnet Ireland has developed the *Women ReBOOT programme* which assists women with technology sector skills and experience to return to work after a career break. Industry-led initiatives include *Connecting Women in Technology*.⁷⁸ Technology Ireland ICT Skillnet has also launched a Foundations Certificate in AI, which has a particular focus on attracting women and migrants.⁷⁹

73. LinkedIn Economic Graph, AI Talent in the European Labour Market, November 2019, see graph on p. 7, <https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/PDF/AI-Talent-in-the-European-Labour-Market.pdf>

74. The 2020 World Economic Forum Global Gender Gap report shows that women hold 26% of jobs in the area of AI and data science in Ireland, in line with the global average.

75. EU High Level Expert Group on AI, Policy and Investment Recommendations for Trustworthy AI (2019), p.26; A 2018 European Commission study on 'Women in the Digital Age' estimates an annual productivity loss of EUR 16.2 billion to the EU economy due to women leaving digital jobs (accessed at: <https://ec.europa.eu/digital-single-market/en/news/increase-gender-gap-digital-sector-study-women-digital-age>).

76. EU Women in Digital Scoreboard 2020, accessed at <https://ec.europa.eu/digital-single-market/en/news/women-digital-scoreboard-2020>

77. www.techireland.org

78. Connecting Women in Technology (www.cwit.ie) is a network of 20 leading multinational technology companies based in Ireland, sharing a common goal to support the development of women in the technology industry.

79. <https://www.ictskillnet.ie/training/foundations-certificate-in-artificial-intelligence/>

An important enabler for long term success is increasing the proportion of girls and women studying STEM subjects. A Gender Balance in STEM group has been set up under the STEM Education Policy Statement to progress this. Government will also develop policies aimed at encouraging women to work in AI, and at identifying and addressing the factors that may be acting as barriers for women in progressing careers in AI.

Case Study: SFI Centres for Research Training

Women in AI (WAI) is a non-profit initiative with a mission to increase female representation and participation in AI. It has developed into a global community of members from over 90 countries with 28 ambassadors working towards gender-inclusive AI for the benefit of global society.

WAI in Ireland was launched in September 2019 as a community-driven initiative. Embracing diversity and forming an inclusive environment for future talent in AI with a focus on women and minorities, it aims to bring empowerment, knowledge and active collaboration via education, research, events, and media content. Branches are currently active in Dublin and Cork.

Objective

A workforce prepared for and adopting AI

Strategic Actions

- i. Deliver a review in 2021 of the skills implications of AI over the next 5 to 10 years, and the skills-related actions needed to realise the potential of AI [DETE, EGFSN]
- ii. Encourage Higher Education Institutions to take a coordinated approach to delivering AI education and training informed by the outcome of the EGFSN review [DFHERIS, HEA and HEIs]
- iii. Assist employers to expand workplace-focused AI upskilling and reskilling, including through apprenticeships, SOLAS programmes, Skillnet Ireland training programmes and enterprise partnership schemes [DFHERIS, Skillnet Ireland, HEA, & SOLAS / DETE, Enterprise AI Advisory Board]
- iv. Consider how AI can be incorporated into future policy for digital learning [D/Education]
- v. Review the criteria for employment permits for critical AI-related skills, having regard to the research and analysis of AI skills needs that is undertaken [DETE]
- v. Establish an expert group to develop an action plan to increase the participation of women in reslated careers [DETE / DFHERIS / D/Education / DCEDIY]

Strand 7:

A Supportive and Secure Infrastructure for AI

Objective

A data, digital and connectivity infrastructure which provides a secure foundation for AI development and use in Ireland



7.1 Introduction

A digital infrastructure serving citizens, SMEs, the public sector and large businesses requires high performance computing, connectivity and infrastructures which facilitate the use of, and access to, high quality and trustworthy data. A strong approach to cybersecurity will be key to maximising trust in AI, particularly where it is deployed in the delivery of essential services such as healthcare and transport. Robust data governance and privacy frameworks are also prerequisites. Consistent application of EU and Council of Europe data protection principles can contribute to the success of AI applications, by generating trust and preventing risks. Finally, the

development and use of AI requires access to secure, high-speed and well-functioning telecommunication networks, as well as sufficient computing power and storage capabilities.

Ireland already has a number of strengths in this area, including a strong track record in open data, a commitment to rigorous data protection standards, and strong investment in recent years in technological and connective infrastructure. Government will build on these strengths to create world-class infrastructure in Ireland for driving the safe and trusted use of data for AI and to solidify its role as a trustworthy location for AI and data governance.

7.2 Trustworthy Data Infrastructure and Governance for AI

AI-based systems are highly data-dependent, so a supportive and trustworthy data infrastructure is paramount to unlock AI's full economic and societal potential. Secure, good quality and robust datasets need to be available and accessible in order for AI application to be successfully developed across sectors. Beneficial AI innovation also relies on strong data governance, which ensures privacy, equity, transparency, and inclusivity. The proposal for an *EU Data Governance Act* is an important initiative in this respect.⁸⁰

As a leading digital nation, Ireland has been proactive in regulating the data economy and in promoting data protection. Now there is an opportunity to serve as a leader in ethical and trustworthy data governance for

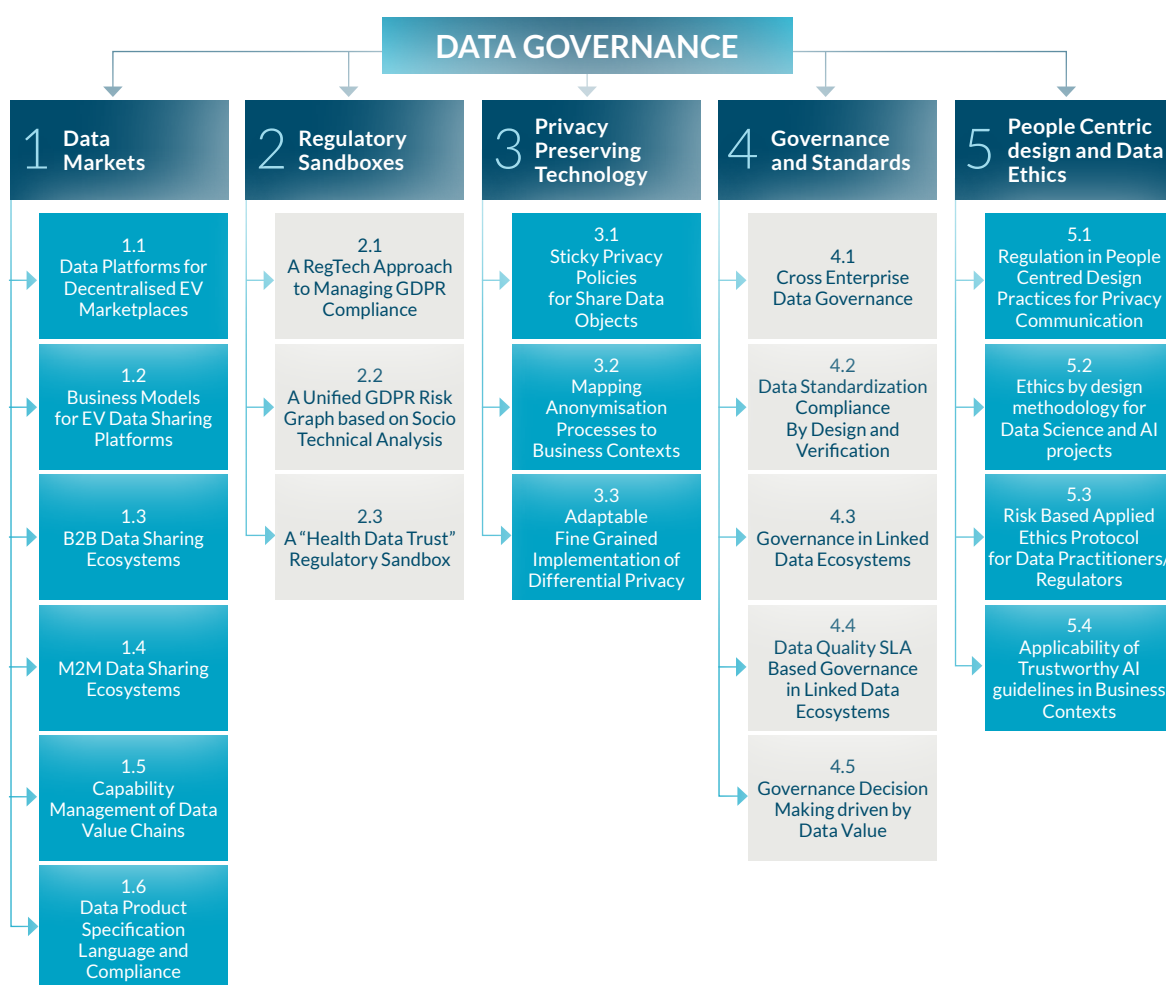
AI, leveraging our reputation for safeguarding data protection and our position as an international data hub in order to pioneer new models of responsible data use and access for AI and ensure the foundations for ethical data sharing.

The three key requirements of strong data governance for AI are:⁸¹

- the quality and integrity of the data used;
- its access protocols and the capability to process data in a manner that protects privacy
- its relevance in light of the domain in which the AI based systems will be deployed.

SFI is co-funding the development of an advisory programme on data governance called EMPOWER, with industry and academia. EMPOWER will create a framework for responsible data governance across non-public service sectors and will develop tools and methodologies to assist businesses in applying that framework.

EMPOWER – elements for a Trustworthy data governance framework



80. European Commission, Proposal for a Regulation of the European Parliament and of the Council on European data governance (Data Governance Act), COM/2020/767 final. Accessed at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0767&qid=1606661852552>

81. The Ethics Guidelines for Trustworthy Artificial Intelligence, developed by the EU AI HLEG

A new Data Governance Board is being established through the Data Sharing and Governance Act (2019), to provide oversight of data sharing and governance within the public service. The Data Governance Board could choose to commission EMPOWER to advise on matters of data usage and data sharing within public service, for example relating to ethical use of data in AI; and on related matters such as the transposition of the forthcoming Data Governance Act.

DATA PROTECTION, ETHICS AND PRIVACY IN THE CONTEXT OF AI

AI is becoming a key technology in automated decision-support systems based on personal data, which may potentially have significant impacts on the fundamental rights of individuals. Strong data protection can serve to build public trust in AI and act as a lever for innovation, while preventing risks to privacy and other rights, and ensuring the foundations for ethical and responsible data sharing.

The EU *General Data Protection Regulation* (GDPR) is a risk-based framework, providing a comprehensive set of data protection rules and principles (Article 5) that are relevant and applicable in the context of AI-based systems. It also establishes recourse for algorithmic decisions, offering individuals the right to a human review of a decision made by an automated AI-based system.

Several rights and provisions of the GDPR are of particular relevance for AI-based profiling and decision making (Recital 71; Articles 5, 12-15, 22, 25 and 35). However, current technical limitations and characteristics of AI models, including the opacity of

some AI systems, can cause difficulties in the practical implementation of relevant GDPR provisions and the related data subject rights.

Two crucial concepts enshrined in law under the GDPR (Article 25), which should be an integral part of planning and implementing any AI project, are data protection by design and data protection by default. Data protection by design means embedding data privacy directly into the design of projects at an early stage. Data protection by default means that user service settings must be automatically data protection friendly, and that only data which is necessary for each specific purpose of the processing should be gathered.

An evaluation of the GDPR by the EU in 2020 recognised it as a flexible, technology-neutral and future-proof tool. However, it acknowledged some challenges lie ahead in clarifying how to interpret and apply the principles to specific technologies such as AI. Data ethics should also be factored into any consideration of GDPR obligations, particularly in complex situations where AI and automated decisions (which may be based on sensitive or inferred data) could impact on peoples' lives in a significant way. Uptake of new AI-based technologies within the public sector will also be subject to risk assessment under the GDPR.

Ireland is committed to upholding rigorous data protection standards for AI, and will collaborate with international partners on this agenda, drawing upon the expertise and recommendations of the Responsible AI and the Data Governance Working Group in the recently established Global Partnership on AI.

82. EU Article 29 Data Protection Working Party Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679, adopted 3 October 2017. See also European Parliament, Scientific Foresight Unit (2020), Study on 'The impact of the General Data Protection Regulation on artificial intelligence', [https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641530/EPRS_STU\(2020\)641530_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641530/EPRS_STU(2020)641530_EN.pdf)

83. European Commission, Communication on Data protection as a pillar of citizens' empowerment and the EU's approach to the digital transition - two years of application of the General Data Protection Regulation', COM(2020) 264 final.

84. GDPR, Article 35.

DATA GOVERNANCE FOR AI – THE BUSINESS OPPORTUNITY

Ireland has already evolved a successful local ecosystem of services around data protection and the development of suitable privacy-enhancing technologies. Irish start-ups and spinouts, such as DataChemist and Truata, are applying cutting-edge knowledge to develop data management and governance platforms. Building on this success, there is strong potential for industry-academic collaboration in Ireland to spawn similar start-ups in the area of data governance for Trustworthy AI. For example, new professional services may be required to assist businesses in:

- Conducting data protection and ethical impact assessments for AI
- Testing for undue bias or quality issues in data sets to be used in training AI
- Understanding the potential value, as well as business risks of adopting specific datasets
- Developing transparent data governance processes across complex data/AI value chains
- Training and upskilling staff to handle data governance and trustworthiness AI issues

ACCESS TO QUALITY DATA FOR AI

AI-based systems are totally data dependent, and lack of access to quality data and datasets is a potential barrier to enterprise adoption of AI, especially for SMEs.

Ireland has established Insight, the SFI Research Centre for Data Analytics, one of Europe's largest data analytics research organisations. Insight undertakes high-impact research, seeking to derive value from Big

Data and providing innovative technology solutions for industry and society.

Where possible, Government will make more public sector data openly, safely and securely available for AI research and innovation and will facilitate the development of trusted environments enabling access to data and collaboration across different organisations.

Case Study: 'Terrain-AI': Data Platform for Sustainable Land Use

The objective of this research, co-funded by Microsoft under SFI's Strategic Partnership Programme, is to develop a digital data platform capable of integrating, analysing and visualising large volumes of Earth observation data, including from satellites, drones and on-site measurements. The platform will increase understanding of how land management practices can influence carbon emissions arising from the landscape, thus enabling more sustainable land management within environmental and regulatory constraints.

ACCESS TO OPEN GOVERNMENT DATA FOR AI

Ireland is currently one of the leading exponents of Open Government Data (i.e., making administrative datasets available to be freely re-used and redistributed by anyone). It has a successful Open Data programme (data.gov.ie) and has been ranked first in Europe for the past three consecutive years (2017, 2018 and 2019). Ireland also achieved fourth place in the *EU Open Data Portal Maturity Report in 2020*⁸⁵ and was placed third in the OECD for Open Government Data in 2019.⁸⁶

Ireland's national *Open Data Strategy 2017-2022* sets out two core objectives:

- ensuring the publication of high value Government data in open format, making it publicly available and freely reusable; and
- engaging with a broad community of stakeholders to promote its social and economic benefits.

85. https://www.europeandataportal.eu/sites/default/files/edp_landscaping_insight_report_n6_2020.pdf

86. OECD, 'Our Data Index: 2019', p.22, <http://www.oecd.org/gov/digital-government/ourdata-index-policy-paper-2020.pdf>

87. which will be set out in Implementing Acts published by the Commission

88. European Commission (2020), 'A European strategy for data' (2020); Communication, "Towards a common European data space", COM/2018/232 final.

Further progress in open data will be facilitated by the new *EU Open Data and ReUse of Public Sector Information (PSI) Directive*, which is due to be transposed into Irish law by July 2021. The Directive provides for the publication by public bodies of ‘High Value Datasets’,⁸⁷ defined as datasets that have the potential to generate significant socio-economic or environmental benefits and innovative services.

Open data is a valuable AI resource for academics, researchers and enterprises. Government can play a key role in stimulating AI innovation by ensuring that the open data infrastructure is AI-friendly and designed for clean, codified, real-time data. To assist in building a shared understanding of the nature and characteristics of datasets needed for AI, Government will hold an Open Data Challenge Fund for AI.

DATA SHARING

Drawing on international experience, Ireland will also promote work to explore mechanisms for responsible data sharing and stewardship within the business and commercial sector, such as data trusts, data cooperatives and data contracts, in order to allow data to flow across sectors in line with clear, practical and fair rules for access. One possible model for increasing access to data for AI is ‘data trusts’. These are legal structures providing for independent, third-party stewardship of data and designed to permit sharing of data in a fair, safe and equitable manner. As frameworks around data-sharing are developed, it is important to ensure a balanced approach that takes into consideration competing interests. This may require new licensing approaches, privacy protections, security considerations, technology platforms, standards and tools, as well as intellectual property policies.

EUROPEAN DATA SPACES

The European Commission views the development of common European data spaces as a key measure to facilitate access to data and boost data sharing, including for AI.⁸⁸ It proposes to establish domain-specific common European data spaces in the areas of industrial manufacturing, the Green Deal, mobility, health, finance, energy, agriculture, public administration, and skills. It is anticipated these data spaces will lead to the availability of large pools of data in the relevant domains, combined with the technical

tools and infrastructures necessary to use and exchange data, as well as appropriate governance mechanisms. The EU has also published guidance principles on private sector data sharing and has launched several R&I actions in this area. More dedicated EU proposals on data spaces are expected to follow in 2021.⁸⁹

DATA FOR AI IN THE PUBLIC SECTOR

Public sector data can help generate insights for public policy and research, enabling Government to better understand the impact of its policy interventions in rapidly evolving circumstances. Responsible data sharing across Government is also one of the key enablers of modern public services, facilitating efficient and cost-effective service delivery. Its benefits include data linking, when two sets of records allow to derive previously unavailable insights, in addition to more tailored interventions, better allocation of public resources, and monitoring of service outcomes.

However, public data is often collected by different administrations and, in many cases, it is fragmented, limited and not easily accessible. The *Public Service Data Strategy 2019-2023* sets out a roadmap to a public sector data ecosystem, including associated governance, for the optimisation of data management across Public Service Body boundaries. The strategy addresses the need for data privacy and security, effective data governance and control, and transparency.

Enabling legislation - The Data Sharing and Governance Act (2019) – is currently being implemented, which will allow public bodies to share personal data for certain purposes and set out appropriate safeguards under which such sharing must take place. The Department of Public Expenditure and Reform is finalising the process of establishing a Data Governance Board to oversee data sharing arrangements under the Act. A data catalogue was established at the beginning of 2021 and standards and guidelines for data sharing by public sector bodies will be issued over the course of 2021.

Full implementation of relevant sectoral legislation (e.g., the INSPIRE Directive on spatial data) will also help provide the domain-specific data needed to support AI applications for the public sector.

87. which will be set out in Implementing Acts published by the Commission

88. European Commission (2020), ‘A European strategy for data’ (2020); Communication, “Towards a common European data space”, COM/2018/232 final.

89. European Commission (2020), Guidance on private sector data sharing, available at <https://ec.europa.eu/digital-single-market/en/guidance-private-sector-data-sharing>

90. In November 2019, Government signed a contract to implement a public investment in future-proof broadband networks in rural Ireland, with an indicative budget of €2.6 billion.

7.3 Digital and Connectivity Infrastructure for AI

Development and use of AI requires a sound and sustainable digital and technological infrastructure in terms of access to computing power, digital connectivity and network capacity. Many of the key technological infrastructures and public policies that are important prerequisites for the successful exploitation of AI, such as broadband and 5G, High Performance Computing (HPC), and Cybersecurity, are long-standing Government priorities, on which substantial progress has been made in recent years. For example, a National 5G Test Centre, RadioSpace, opened in Maynooth University in 2019. It is the country's first large-scale facility for the research and testing of radio and wireless technologies needed for 5G and the future Internet of Things.

Next-generation AI-based solutions will also demand more computational power and will need to be more cost and energy efficient to meet the needs of increasingly sophisticated training models. Computation will also increasingly move to 'the edge', on devices that are closer to the users of real-time AI applications. Furthermore, the tight interconnection of data infrastructure with a HPC infrastructure is vital to the successful development and deployment of AI systems and the European Commission is taking important steps to enable the next generation of data processing infrastructures.

Access to sufficient computing power for AI in Ireland will be secured through the use of both national and international resources. To develop and strengthen the national data and HPC platforms, pan-European initiatives such as *EuroHPC* should be leveraged since they offer amplification of national investments with matched EU funding, as well as allowing Ireland to participate in and contribute to European expertise in AI. Developing national data and HPC platforms also opens up highly valuable opportunities for national-level strategic partnerships to establish AI and HPC technology centres of excellence with enterprise and research partners.

Ireland currently participates in *EuroHPC*, and is committed to the *Digital Europe Programme*, through which the European Commission has proposed appropriate funding for HPC and quantum computing, as well as edge computing. The Department of Further and Higher Education, Research, Innovation and Science has established an Advisory Group on High Performance Computing to exchange views and

advise on how best to position Ireland and exploit opportunities in HPC relevant areas (including AI).

Another enabler for AI is Cloud-based infrastructure that provides virtualised computing resources and storage of data (for example servers, software, databases, data analytics) that can be accessed remotely. At EU level, there is a focus on developing pan-European cloud-services, with the launch of GAIA-X (the European Cloud Infrastructure initiative) in June 2020, as well as the Member States' *Joint declaration on building the next generation cloud for businesses and the public sector in the EU* in October 2020,⁹¹ which has been signed by Ireland, and establishment of a European Alliance on Industrial Data and Cloud in December 2020.

7.4 AI and Cybersecurity

AI-based systems should be safe (performing as intended) and secure (resistant to being compromised by unauthorised parties). A strong approach to security for digital infrastructure will be key to maximising trust in AI, particularly where it is deployed in the delivery of essential services such as healthcare and transport.

Challenges posed by AI in this respect include an increased cyber security attack surface, as well as the potential for adversarial AI and for manipulation of AI for criminal or terrorist purposes. Illicit AI-related activities are likely to increase as the technology is diffused. The National Security Analysis Centre is considering potential threats that AI technologies could pose to State security as part of its ongoing work on the development of a new National Security Strategy

Government has taken an evolving series of measures to mitigate cyber security risks and develop the policy framework in this area, fostering relevant innovation, capacity-building, awareness-raising and R&I initiatives. Ireland's National Cyber Security Strategy, published in December 2019, outlines how the Government will continue to protect the security of the country's computer networks and associated infrastructure. The Strategy is built around three platforms for action:

- **'Protect'** – a set of measures designed to further improve the security of IT systems in the State, including critical infrastructure protection;
- **'Develop'** – measures to develop capacity and employment in Cyber Security in the State, and
- **'Engage'** – measures to improve how the State engages nationally and internationally on cyber security matters, including in diplomatic and law enforcement terms.

90. In November 2019, Government signed a contract to implement a public investment in future-proof broadband networks in rural Ireland, with an indicative budget of €2.6 billion.

91. <https://ec.europa.eu/digital-single-market/en/news/commission-welcomes-member-states-declaration-eu-cloud-federation>

Under this Strategy, the **National Cyber Security Centre (NCSC)** has been formally established within the Department of Environment, Climate and Communications. The NCSC has three main roles:

- **National Incident Response** - this means leading a strategic national incident response process, including co-ordinating across Government and internationally.
- **Information Sharing** - the NCSC acts as a source of expert advice and guidance, but also as a 'clearing house' for relevant information (including cyber-intelligence and threat information) and it makes sure that people who need that data get it.
- **Building Resilience** - providing guidance, support and interventions across Government and the Private sector.

As the 2021 ransomware attack on the HSE has demonstrated, there is no room for complacency with respect to Cyber Security, and the development of the NCSC will evolve continuously, to reflect its important mandate.

AI technologies can play a part in strengthening organisations' cyber security. AI can be used as a tool to automate or augment aspects of cyber security, for example, through the deployment of active firewalls

or smart antivirus protection. AI technologies can also be used to facilitate the efforts of the law enforcement and other public authorities to better respond to cybercrime, including the analysis of the exponential growth of Big Data in the context of investigations, as well as potential criminal misuse of AI.

The Government recognises the importance of building future skills for cyber security. Since October 2018, Skillnet Ireland has been implementing the Cyber Security Skills Initiative in partnership with the NCSC, Garda National Cyber Crime Bureau, together with other agencies and third level institutions. The core aims of the initiative are to develop awareness, bridge the skills gap and to set standards for skills and competencies for cyber security roles. The third level sector in Ireland is also now offering a significant number of courses in cyber security, with a number of Masters level courses now on offer. In addition, a 2 year Associate Professional in Cyber Security apprenticeship at QQI level 6 has been approved by Apprenticeship Council and funded under the National Training Fund, while a number of cybersecurity courses are also being funded under the Springboard+ programme to facilitate those already in employment to reskill into alternative roles or occupations.

Objective

A data, digital and connectivity infrastructure which provides a secure foundation for AI development and use in Ireland

Strategic Actions

- i. Building on initiatives such as the EMPOWER program, provide a framework for trustworthy data governance across the private sector and develop tools and methodologies to apply the framework. [DFHERIS, SFI / DETE, EI, IDA]
- ii. Promulgate standards and guidelines for ethical data sharing within the Public Service [DPER / Data Governance Board]
- iii. Increase the availability of open government data for AI training and testing, including by holding an AI Open Data Challenge [DPER / CSO]
- iv. Identify public sector climate and environmental open datasets to encourage development of AI solutions for climate action [DPER / DECC, EPA, SEAI]

Strand 8:

Implementation of the Strategy

Introduction

This strategy has set out a comprehensive agenda and suite of strategic actions to help Government achieve its vision of Ireland as an international leader in using AI to the benefit of our population, through a people-centered, ethical approach to AI development, adoption and use. It is a whole of Government strategy, which will require coordinated action from a number of Government Departments, agencies and bodies, as set out in the relevant Strands.

The AI strategy also forms an important part of overall digital strategy for Ireland; the drivers and enablers for AI are very similar to those for other digital technologies. Therefore, the AI strategy will be implemented through the framework that Government is establishing to drive and oversee Ireland's digital transition, with specific strategic actions led by nominated Government Departments, State agencies or other bodies, as set out in the relevant Strands.

Oversight of Strategy Implementation

An **Enterprise Digital Advisory Board** will be established to advise and work with Government to drive enterprise adoption of digital technologies, including AI. The Board members will include relevant Government Departments, representatives from MNEs and SMEs, AI experts, the IDA and Enterprise Ireland. The Board will be chaired by the Minister of State for Trade Promotion, Digital and Company Regulation.

The Board will oversee the implementation of the enterprise elements of the AI Strategy. It will also advise and work with Government to drive enterprise adoption of AI including through:

1. Assessing the current spectrum of AI resources available to industry from technology centres and relevant agencies to inform actions needed to maximise the potential of the existing infrastructure
2. Developing an AI programme for enterprise of targeted funding measures, together with diagnostic tools and other advisory supports around AI adoption

3. Raising awareness among businesses of all sizes – from small SMEs through to MNEs – of the resources available from European Digital Innovation Hubs/centres of excellence
4. Developing a National AI cluster or platform to drive collaboration between MNCs and SMEs.

AI Innovation Hub

An **AI Innovation Hub** will also be established, to act as a National First Stop for AI, providing expertise and guidance to enterprises on their AI adoption journey. It will be one of four national-level European Digital Innovation Hubs (EDIHs) which will be established in Ireland as part of the EU-wide network to be launched in May 2021. The AI Innovation Hub will provide upskilling, innovation and advisory services (including in the area of standards, data protection and regulatory compliance) to enterprises and public authorities in areas aligned to AI, as well as offering access to technical expertise, research facilities and experimentation. It will also offer access to SME incubators, providing access to infrastructure, technologies and test beds.

Driving Public Trust in AI

Building public trust in and engagement with AI will be essential to the overall success of the AI strategy. Government will appoint an **AI ambassador** to promote awareness among the public and businesses of the potential that AI offers, serving as a champion of AI as a positive force for the economy and society. The AI ambassador will be a member of the Enterprise Digital Advisory Board, and will be supported in their work by the Board and by the Department of Enterprise, Trade and Employment.

Driving AI Adoption by the Public Service

Government plans to establish a **GovTech Delivery Board**, which will lead the digital transformation of the public service. The Board will consider AI adoption in the public service as part of its work.

Driving Standards for AI

A Top Team on Standards for AI has been put in place to expand Ireland’s international leadership in AI Standards development. Led by the NSAI, the Top Team is working with academia, industry and regulators to develop a roadmap for AI Standards.

Ongoing Review of Strategy

This Strategy will be responsive and flexible, in keeping with the rapidly evolving technologies and the issues it must address. As AI technologies and applications develop, there may be a need for new approaches and initiatives that we cannot foresee today. To allow for this responsiveness, Government will develop a detailed action plan, to drive implementation of the strategy, and this action plan will be updated each year to address emerging challenges and opportunities.

Glossary of Acronyms

AI	Artificial Intelligence
ALTAI	Assessment List for Trustworthy Artificial Intelligence
CAHAI	Ad Hoc Committee on Artificial Intelligence
CCPC	Competition and Consumer Protection Commission
CCI	Cybersecurity and Cybercrime Investigation
CeADAR	Ireland's Centre for Applied Artificial Intelligence
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CEPEJ	European Commission for the Efficiency of Justice
CLRG	Company Law Review Group
CRT	Centres for Research Training
CSO	Central Statistics Office
DAFM	Department of Agriculture, Food and the Marine
DFA	Department of Foreign Affairs
DCEDIY	Department of Children, Equality, Disability, Integration and Youth
DCU	Dublin City University
DETE	Department of Enterprise, Trade and Employment
DECC	Department of the Environment, Climate and Communications
DESI	Digital Economy and Society Index
DFHERIS	Department of Further and Higher Education, Research, Innovation and Science
DFKI	German Research Centre for Artificial Intelligence
DIH	Digital Innovation Hub
DoE	Department of Education
DoJ	Department of Justice
DoH	Department of Health
DPAI	Data Protection Impact Assessment
DPER	Department of Public Expenditure and Reform
DTCAGSM	Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media
DTIF	Disruptive Technologies Innovation Fund
EDIHs	European Digital Innovation Hubs
EGFSN	Expert Group on Future Skills Needs
EI	Enterprise Ireland
EPA	Environmental Protection Agency
ESO	European Standards Organizations
ETSI	European Telecommunications Standards Institute
EU	European Union
FET	Further Education and Training
GCID	Grand Canal Innovation District
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation

GGE on LAWS	UN Group of Governmental Experts on Lethal Autonomous Weapons Systems
GPAI	Global Partnership on AI
GSI	Geological Survey Ireland
HE	Higher Education
HEA	Higher Education Authority
HEI	Higher Education Institutes
HLEG	EU AI High Level Expert Group
HPC	High Performance Computing
HSE	Health Service Executive
IA	Impact assessments
ICHEC	Irish Centre for High-end Computing
ICT	Information and Communications
IEC	International Electrotechnical Commission
IF	SFI Industry Fellowship
IMR	Irish Manufacturing Research
IP	Intellectual Property
IPCEI	Important Projects of Common European Interest
IRC	Irish Research Council
ISO	International Organization for Standardization
ITI	InterTrade Ireland
MOOC	Massive Open Online Course
MNE	Multinational Enterprise
NSAI	National Standards Authority of Ireland
OECD	Organisation for Economic Cooperation and Development
OGP	Office of Government Procurement
ONE-AI	OECD on Network of Experts on AI
RCSI	Royal College of Surgeons Ireland
R&I	Research and innovation
REC	Research Ethics Committee
RTEF	Reference Testing and Experimentation Facilities
SEAI	Sustainable Energy Authority of Ireland
SFI	Science Foundation Ireland
SME	Small and Medium-Sized Enterprises
STEM	Science, technology, engineering, and mathematics
TUD	Technological University Dublin
UCC	University College Cork
UCD	University College Dublin
UN	United Nations
UNGP	UN Guiding Principles on Business and Human Rights
WAI	Women in AI
WIPO	World Intellectual Property Organisation

List of Organisations Consulted

The list below reflects the organisations that took part in a range of stakeholder engagements throughout the development of this strategy. The range of engagements includes roundtable meetings, forums, workshops, bilateral meetings, among other engagements. It is not an exhaustive list and may not have captured every organisation that took part in the development of the strategy. The written submissions to the strategy are available on the Department of Enterprise, Trade and Employment's website at:

<https://enterprise.gov.ie/en/Consultations/Public-Consultation-Development-of-a-National-Strategy-on-Artificial-Intelligence.html>

- 30% Club
- Accenture
- AJH Emerging Technology Intelligence
- Allied Irish Banks
- American Chamber of Commerce
- Arvoia
- Cainthus
- CarTrawler
- CeADAR Ireland's Centre for Applied Artificial Intelligence
- Central Bank
- Chambers Ireland
- Concern Worldwide
- CONFIRM Centre (AIT)
- CONSUS (Crop Optimisation through Sensing, Understanding & viSualisation)
- CR Robotics
- Data Protection Commission
- Department of Agriculture, Food and the Marine
- Department of Children, Equality, Disability, Integration and Youth
- Department of Defence
- Department of Education
- Department of Enterprise, Trade and Employment
- Department of Environment, Climate and Communication
- Department of Finance
- Department of Foreign Affairs
- Department of Further and Higher Education, Research, Innovation and Science
- Department of Health
- Department of Housing, Local Government and Heritage
- Department of Justice
- Department of Public Expenditure and Reform
- Department of Rural and Community Development
- Department of Social Protection
- Department of the Taoiseach
- Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media
- Department of Transport
- Digital Skills Global
- Dublin Chamber of Commerce
- Dublin City University, Business School
- Dublin City University, School of Computing
- Dublin City University, School of Electronic Engineering
- Edgetier
- Enable Ireland
- Enterprise Ireland
- Fotonation / Xperi
- FourTheorem
- Freedomtech
- FTI Consulting
- Genesys
- Health and Safety Authority
- Ibec
- IBM
- ICT Skillnet
- IDA Ireland
- I-Form Advanced Manufacturing Research Centre
- Industry Research and Development Group
- Insight Centre for Data Analytics
- Institute of Chartered Accountants Ireland
- Insurance Ireland
- Intel
- InterTrade Ireland
- Irish Centre for High-End Computing
- Irish Computer Society/ICS Foundation
- Irish Congress of Trade Unions
- Irish Human Rights and Equality Commission
- Irish Institute of Digital Business
- Irish Manufacturing Research
- Irish Marie Skłodowska-Curie Office
- Irish Small and Medium Enterprises Association
- Irish Universities Association
- Jaguar Land Rover

- Kerry Group
- Law Society of Ireland
- Learnovate
- Letterkenny Institute of Technology, Department of Computing
- Lincoln Recruitment
- Live tiles
- Mason Hayes Curran
- Mastercard Labs
- Met Éireann
- Microsoft
- National Archives
- National Standards Authority of Ireland
- National University of Ireland Galway, School of Computer Science
- National University of Ireland Maynooth, Department of Computer Science
- National University of Ireland Maynooth, School of Business
- Nokia Bell Labs
- Office of the Government Chief Information Officer
- Office of the Revenue Commissioners
- Science Foundation Ireland
- Science Foundation Ireland Centre for Research Training in Machine Learning
- ServisBot
- Skillnet Ireland
- Small Firms Association
- SOLAS
- Swrve
- Talent Garden
- Tech Ireland
- Technological University Dublin, School of Computer Science
- The ADAPT Centre
- The Competition and Consumer Protection Commission
- Trinity College Dublin, School of Computer Science and Statistics
- Trinity College Dublin, School of Creative Arts
- Truata
- Ubotica
- University College Cork, School of Computer Science & IT
- University College Dublin, School of Computer Science
- University College Dublin, School of Information and Communication Studies
- University of Limerick LERO, Science Foundation Ireland Research Centre for Software
- Version1
- Vodafone
- Waterford Institute of Technology, Telecommunications Software & Systems Group
- Webio



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