

MALTA

THE ULTIMATE AI LAUNCHPAD

A Strategy and Vision for Artificial Intelligence in Malta 2030

October 2019

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The pace of innovation continues to accelerate. Indeed, as artificial intelligence becomes ever-more prevalent and intersects across our lives to redefine the man and machine relationship, many commentators believe that we are on the brink of a revolution on the same scale as the industrial one. Clearly then, it is vital for Malta to have the foresight to look beyond the present and lay the foundations today to excel in tomorrow's world.

The Strategy and Vision for Artificial Intelligence in Malta aims to ensure that benefits brought about by this next wave of innovation delivers benefits across all segments of Maltese society. At the same time, we need to be vigilant of the risks and transformations ahead.

This requires awareness and understanding amongst the general population and business community alike of what AI is and why it is important. It necessitates creating trust in how AI works in terms of transparency and accountability.

In developing this strategy, we included an explicit aim to put Malta amongst the top 10 nations with the highest impact national AI programme. While some of the actions in this respect are already well underway – we are launching the world's first national AI certification programme – the fruit of other actions will take longer to come to fruition. However, the groundwork will commence right away.

We plan to gradually infuse AI into education, healthcare and a range of public services to deliver better services to Malta's citizens and businesses, enhance economic and social well-being, and drive operational excellence across the public administration. We will do this transparently and in consultation with the public and key stakeholders to build common understanding, awareness and trust along the way.

Foreword

HON. SILVIO SCHEMBRI

Parliamentary Secretary for Financial Services,
Digital Economy and Innovation

The strategy sets out six AI-related pilot projects to be undertaken and we expect more to be identified as we look forward.

We will also be investing heavily in tools and skills to ensure that we have the capability to grasp the opportunities ahead. The strategy sets out actions to equip all students enrolled in higher education programmes in Malta with AI skills and knowledge. Scholarships and personal tax incentives will be used to leverage and increase the number of post-graduate AI specialists.

Our current workforce will not be left behind. We will be setting up a think tank, together with key stakeholders and social partners, to understand and plan for the impact of technology and automation across the wider Maltese labour market. In conjunction, we will also assist vulnerable workers to develop new digital skills and give due focus to supporting life-long learning and upskilling activities. We will also invest in developing language tools to enable us to communicate with our digital devices in Maltese, just as seamlessly as we currently do in English.

Our vision is for Malta to become the **"Ultimate AI Launchpad"**. We expect this strategy to catalyse R&D and innovation across the country. We will look to set up regulatory and data sandboxes for AI to help companies test innovative concepts and solutions in a contained environment with proportionate safeguards. We want to build a vibrant start-up community and encourage its members to collaborate with local businesses looking to infuse AI into their operations.

We want AI to help Malta's citizens and businesses get ahead and as a government we will do all we can to do so. We are committed to pursuing the Malta AI Strategy and Vision in partnership with our country's citizens. Conscious that this is a new area, we shall nurture dialogue to ensure that stakeholders can ask questions, voice concerns and make recommendations as we take this strategy forward.

In conclusion, I would like to express my gratitude to the Malta.AI Taskforce, Working Groups, and all the stakeholders and individuals who contributed to the development of this strategy. I look forward to your support in working towards our vision.



Few would dispute that technology is becoming ever more intertwined with our daily lives. Yet it appears we are only starting to scratch the surface of what is to come over the next two decades. Artificial intelligence AI is expected to become the most important and transformative general-purpose technology GPT of our era and radically alter our way of life, both economically and socially, as the wheel, electricity, cars, computers and the internet did in the past.

Throughout 2019, the Malta.AI Taskforce and Working Groups have worked hard to develop a National AI Strategy that aims to create a lasting and positive impact on Malta's citizens and businesses. This is just the beginning of Malta's journey into this exciting new era, but already, in some aspects, we are well ahead of the game.

In 1995, Malta launched one of the first AI degree programmes in Europe and has steadily built up AI expertise over the years. Last year, the country became a pioneer in its creation of the Malta Digital Innovation Authority (MDIA), a regulatory authority responsible for governmental policies aimed at positioning Malta as a centre for excellence and innovation across digital technologies.

In parallel with the launch of strategy, Malta has published its ethical AI Framework, *Towards Trustworthy AI*. The document builds on the work of various international bodies and organisations and establishes a set of guiding principles and trustworthy AI governance and control mechanisms to guide

Foreword

WAYNE GRIXTI

Chair of Malta.AI Taskforce

AI practitioners on how to design, train and operate AI in a trusted and ethical manner.

Taking a further leap forward, the MDIA will publish guidelines for the world's first national AI certification programme. The programme will be voluntary, at least initially, and aims to provide applicants with valuable recognition in the marketplace that their AI systems have been developed in an ethically aligned, transparent and socially responsible manner. Certification will be awarded following a thorough audit process undertaken by independent experts authorised by the MDIA. We expect that many nations will look to follow our lead in this respect. On behalf of both the Malta.AI Taskforce and the MDIA, we would welcome the opportunity to share our experiences and knowledge with you.

Collaboration will be a central theme that underpins Malta's AI ecosystem as we take this strategy forward together with Malta's citizens and businesses. As a small country, we want to team, share and co-innovate with governments, organisations, researchers, tech entrepreneurs and pioneers from around the world to explore, showcase and champion the benefits that AI can deliver.

Our aspiration is for Malta to become the **"Ultimate AI Launchpad"** – a place in which local and foreign companies, and entrepreneurs, can develop, prototype, test and scale AI, and ultimately showcase the value of their innovations across an entire nation primed for adoption. Our ambition is to create the conditions for AI to springboard from Malta to the rest of the world.

We are not there yet, with much work still to be done. I therefore ask for your support in helping us take this strategy and its actions forward over the coming years. The MDIA has been tasked with the responsibility for the monitoring and governance of the strategy's implementation, and, as its Chief Technology Officer, I will continue to be involved. I look forward to working with Malta's stakeholders to turn our vision into a reality.

EXECUTIVE SUMMARY



Executive Summary

A Strategy and Vision for Artificial Intelligence in Malta 2030 aims to map the path for Malta to gain a strategic competitive advantage in the global economy as a leader in the AI field.

The Strategy is expansive, looking at the impact commercially and socially, areas of economic opportunity and the need for special consideration, if not regulation, where AI use cases potentially intersect with national priorities, values and citizen's rights.

The Strategy has been built on the following **three strategic pillars**:

Investment, start-ups and innovation: sets out initiatives to generate investment and position the country as a hub for AI application and niche areas of research and development, supported by a vibrant start-up community.

Public sector adoption: explores how AI can be deployed widely across the public administration to improve citizens' experiences, expand access to public services, and directly improve well-being. Six AI pilot projects covering traffic management, education, health, customer service, tourism, and utilities will be undertaken over the coming three years.

Private sector adoption: details initiatives to drive awareness and enable companies of all sizes to use, develop and integrate AI applications across their organisations. Support measures include access to technological expertise, the provision of toolkits and financial assistance.

Each pillar draws on three strategic enablers:

Education and workforce: plans for the impact of technology and automation on the Maltese labour market and proposes measures to assist workers to develop new digital skills, increase the number of AI specialists and equip all students on higher education programmes in Malta with AI knowledge.

Ethical and legal: establishes the world's first national AI certification programme to provide a platform to practitioners and companies that wish to showcase ethically aligned, transparent and socially responsible AI solutions, building on Malta's Ethical AI Framework Towards Trustworthy AI. It makes provision for the formation of a Technology Regulation Advisory Committee to advise on laws and regulation in respect to AI matters and the creation of regulatory and data sandboxes.

Ecosystem infrastructure: lays out investments in tools to enable Maltese Language AI solutions, initiatives to support data availability and actions to mitigate cybersecurity risks and facilitate cost-effective access to high-performance compute capability among other measures designed to create the underlying infrastructure to support a thriving AI ecosystem.

The document sets a vision for Malta to become the **"Ultimate AI Launchpad"** by 2030 and a Strategy, supported by a series of actions to be undertaken between 2019-2022 to lay the foundations to get there.





CHAPTER 1

INTRODUCTION AND BACKGROUND





What is AI?

- After more than six decades as an academic discipline, and several cycles of hope, hype and decline, the field of artificial intelligence (AI) has emerged from the laboratory as a science project into a more consumable, commercially viable and socially impactful technological innovation.
- Defining what AI actually is remains challenging. Experts have not yet reached an agreement on the matter, so AI has many different definitions which are constantly evolving. The reason for this is that AI consists of a wide range of technologies, scientific approaches and definitions which are simultaneously being researched, discovered and taken forward to expand what is possible.
- The European Commission's AI HLEG published *A definition of Artificial Intelligence: main capabilities and scientific discipline in December 2018*¹. This seven-page document opened with a disclaimer: "The following description and definition of AI capabilities and research areas is a very crude oversimplification of the state of the art. The intent of this document is not to precisely and comprehensively define all AI techniques and capabilities, but to describe summarily the joint understanding of this discipline that the High-Level Expert Group is using in its deliverables".
- The definition provided in the document states: "Artificial intelligence (AI) refers to systems designed by humans that, given a complex goal, act in the physical or digital world by perceiving their environment, interpreting the collected structured or unstructured data, reasoning on the knowledge derived from this data and deciding the best action(s) to take (according to predefined parameters) to achieve the given goal. AI systems can also be designed to learn to adapt their behaviour by analysing how the environment is affected by their previous actions. As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search and optimisation), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems)."
- Put simply, AI uses data and algorithms (a set of instructions using mathematical formulae) on computers or other technological systems to perform specific tasks or make decisions that usually require human intelligence, such as learning, problem solving, pattern recognition, visual perception and speech recognition. Trained AI can perform these tasks or make these decisions without explicit human instructions using a series of techniques and technologies.

¹Source: European Commission's High-Level Expert Group on AI (2018). *A definition of Artificial Intelligence: main capabilities and scientific disciplines*. European Commission.

- Most of us interact with AI-based systems on a daily basis without paying too much attention to them. Common applications that embed AI technologies include search engines, virtual voice assistants, spam filters, websites with online shopping recommendations, and social media channels.
- Although most commonly software application based, such as on smart phones and computers, AI technologies can also be embedded into other physical hardware devices such as drones, autonomous cars and robotics.

How intelligent is AI?

- AI has sparked existential debates on the fate of humanity. In 2014, the late Stephen Hawking stirred controversy when he told the BBC that: “The development of full artificial intelligence could spell the end of the human race².”
- His reference to “full” relates to the distinction between general and narrow intelligence. Humans learn and apply such learnings across domains: in other words, the human brain can “generalise” knowledge gained from a single experience and apply such knowledge to different experiences in entirely different contexts.
- Machines are not yet able to replicate this deeply human skill. Even the “smartest” and most powerful AI systems today, which can outperform humans in a specific task, such as playing a particular game or diagnosing a certain type of cancer, are not able to generalise knowledge beyond a specific task and context. Therefore, they are often called “narrow AI.”
- While it may be possible, in the distant future, for human engineers to architect an AI that can demonstrate a more general intelligence, no currently available system can or will evolve, organically, to become full or general.
- Consequently, this future scenario in which machines “generally” outthink humans to become a threat to humanity itself is not a practical scenario and has limited utility for public policy makers.
- Rather, discussions about the rise of sentient AI are proper topics for academic circles, future-focused think tanks and Hollywood producers. They are otherwise a distraction from the real and current risks of AI that must be understood and considered by public policy makers.
- A more pragmatic threat worthy of policy consideration is how humans may corrupt or misapply this technology. Policy makers should also predict and influence how AI might change governance, society, health, work and other aspects of life.

Why does AI matter?

- AI is widely considered to be a general purpose technology. In other words, it has functions and characteristics which can generate and spread incremental and radical innovation and business growth across different fields, activities and sectors.
- Research conducted on behalf of the World Economic Forum³ highlighted that AI is projected to underpin close to 14 trillion of global economic growth by 2030 and drive significant productivity gains, if not transform how businesses operate, across all sectors of the global economy.
- Though the timeline and nature of impact will play out differently across sectors and countries, AI is expected to make a noticeable difference to each and every one of us. Beyond the workplace and industry, AI will also transform the way we live and play.
- There have been fewer than 30 general purpose technologies⁴ throughout human history. The wheel, the internal combustion engine, electricity, cars, computers and the internet are amongst them. AI has now joined this exclusive set of historical milestones, highlighting just how big the impact is expected to be.
- Some of AI's most impactful applications revolve around how it can be used to achieve positive outcomes for society:
 - In the healthcare field, extensive work is underway to use AI to detect and diagnose various forms of cancer, monitor health and provide individuals with personalised treatment plans
 - Various countries are using AI to help prevent traffic jams and manage traffic flows, thereby reducing travel times and decreasing emissions
 - In the education field, AI is being used to help teachers provide feedback on students' homework, enhance early childhood vocabulary development, learn and practice foreign languages, and assist with personalised learning content outside the classroom
 - In some countries, farmers are deploying AI systems to identify pests, diseases and nutritional deficiencies in crops and to determine water and fertiliser needs accurately, thereby reducing costs, improving yields and decreasing pesticide usage

² Source: Cellan-Jones, R. (2014). Stephen Hawking warns artificial intelligence could end mankind. BBC News. [online] Available at: <https://www.bbc.com/news/technology-30290540> [Accessed 20 Jun 2019].

³ Source: PwC. (2017). Sizing the prize: World Economic Forum

⁴ Source: Lipsey, R., Carlaw, K. and Bekar, C. (2005). Economic Transformations: General Purpose Technologies and Long Term Economic Growth. Oxford University Press.

Why are some people concerned?

- The benefits that AI will bring about are vast, but the technology also creates various risks that need to be addressed and appropriately managed.
- AI raises profound questions across ethical, legal and regulatory domains, touching a range of areas from protecting national security and citizen rights to advancing commercial interests and international standing. These include the risks of biased and unaccountable automated decision-making, discrimination, data privacy-related issues, cyber threats and the potential for manipulation of political systems and wider society in general.
- Various nations, international organisations, standards agencies and bodies are developing research, principles, guidelines, standards and control frameworks aimed at enhancing trust and ethics in the design, deployment and use of AI systems.
- The potential for technological job displacement is also a major concern for policy makers. Various studies have been undertaken by academics, research institutes and government bodies on the potential impact that automation will have on the workforce, but there appears to be little consensus on both the number of jobs at high risk from automation and the number of new jobs that are expected to be created by the technology.
- One of the most widely quoted and influential studies was conducted by Carl Frey and Michael Osborne from Oxford University in 2013. It forecast that around 47% of jobs in the US were at high risk of being automated⁵ from a 'technologically capable' perspective.
- Numerous other studies on the topic have since been undertaken, including one by the OECD⁶, which expanded on this work by examining all the tasks that workers carry out across their jobs. The research put the US figure at 10% and 12% for all OECD nations. It also highlighted that the variance in automatability across countries is large, with 33% of all jobs in a Central European country deemed to be highly automatable, compared with only 6% of the jobs in a country in the Nordics.
- A 2018 study by Accenture estimated that: "If companies were to invest in AI and human-machine collaboration at the same level as the top-performing fifth of companies globally, they could boost revenues by 38% and lift employment levels by 10% between 2018 and 2022."⁷ The World Economic Forum estimates that automation will displace 75 million jobs but generate 133 million new ones worldwide by 2022 in *The Future of Jobs Report 2018*⁸.

⁵ Source: Frey, C. and Osborne, M. (2017). The future of employment: How susceptible are jobs to computerisation?. *Technological Forecasting and Social Change*, p.114

⁶ Source: Nedelkoska, L. and Quintini, G. (2018). Automation, skills use and training: OECD Social, Employment and Migration Working Papers No. 202, OECD

⁷ Source: Shook, E and Knickrehm, M. (2018). *Reworking the Revolution*: Accenture

⁸ Source: World Economic Forum (2018). *The Future of Jobs Report 2018*



- EY's recent report, *The Future of Work*, highlights how difficult it is to forecast the nature and impact of technology on jobs. It outlines how studies may overstate the extent of machine substitution for human labour due to a lack of useful and accurate data, or understate the strong complementary role of automation in boosting productivity and employment. The report does, however, stress that a counter-scenario could play out in which sudden shock job losses occur in the short term. Its key message stresses that policy actions should be a national imperative to ensure workers get future-ready and quickly acquire the new skills needed to adapt this changing world as the pace of change accelerates over the next decade⁹.

AI in the EU

- In April 2018, the European Commission published the *Communication on Artificial Intelligence for Europe*¹⁰, a 20-page document that lays out the EU's approach to AI, to ensure that Member States work together on the most important issues relating to AI to ensure that:
 - Europe is competitive in the AI landscape
 - No one is left behind in the digital transformation
 - New technologies are based on values
- *The Communication on Artificial Intelligence for Europe* sets out a European initiative on AI which aims to:
 - Boost the EU's technological and industrial capacity and AI uptake across the economy
 - Prepare for socio-economic changes brought about by AI
 - Ensure an appropriate ethical and legal framework
- The Communication sets out how €1.5 billion will be made available to support AI research between 2018 and 2020, with the EU having already invested €1.1 billion in AI-related research under the Horizon 2020 research and innovation programme between 2014 and 2017.
- The European Commission also established the European AI Alliance as a multi-stakeholder forum for engaging in a broad and open discussion of all aspects of AI development and its impact on the economy and society. It is steered by the AI HLEG, which consists of 52 experts who have been selected by the European Commission for this task.
- The AI HLEG has a general objective to support the implementation of the European Strategy on Artificial Intelligence. This includes making recommendations on future-related policy development and on ethical, legal and societal issues related to AI, including socio-economic challenges¹¹.

- The European Commission worked with Member States, including Malta, to develop the *Coordinated Plan on Artificial Intelligence*¹², which was published in December 2018. The goal of the plan is to "maximise the impact of investments at EU and national levels, encourage synergies and cooperation across the EU, exchange best practices and collectively define the way forward to ensure that the EU can compete globally."
- This plan proposes joint actions for closer and more efficient cooperation between Member States, Norway, Switzerland and the European Commission in four key areas: to increase investment, make more data available, foster talent and ensure trust.
- As part of this process, all Member States were asked to develop national AI strategies which address the countries' specific priorities. Some of these strategies have been published and others are expected in 2019.
- The European Parliament and the Council of the European Union reached a provisional political agreement in February 2019 on the first ever Digital Europe Programme, which will see €9.2 billion invested between 2021 and 2027¹³ across five key digital areas¹⁴:
 - €2.7 billion to build up, strengthen and increase accessibility to supercomputing
 - €2.5 billion to invest in and drive adoption of AI by businesses and public administrations; facilitate safe access to and storage of large data sets and algorithms; and strengthen testing and experimentation facilities
 - €2 billion to support the procurement, development and deployment of advanced cybersecurity equipment, tools, data infrastructures and knowledge
 - €700 million to support the current and future workforce in EU countries, including Malta, to acquire advanced digital skills through long- and short-term training courses and on-the-job training and traineeships
 - €1.3 billion to support the wide use of digital technologies across the economy and society, including the public sector and areas of public interests, such as healthcare, education, transport, and the cultural and creative sectors

⁹ Source: Halloran, L. and Andrews, J. (2018). *The Future of Work*: EY

¹⁰ Source: Communication from the Commission (2018). *Artificial Intelligence for Europe* (COM(2018) 237 final). European Commission.

¹¹ Source: European Commission. High-Level Expert Group on Artificial Intelligence. [online] Available at: <https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence> [Accessed 25 Jul. 2019].

¹² Source: Communication from the Commission (2018). *Coordinated Plan on Artificial Intelligence* (COM(2018) 795 final – Annex). European Commission.

¹³ Source: European Commission. EU budget: Commission proposes €9.2 billion investment in first ever digital programme. [online] Available at: https://europa.eu/rapid/press-release_IP-18-4043_en.htm [Accessed 11 Mar. 2019].

¹⁴ Source: DG Connect (2019). *Digital Europe Programme Factsheet*. European Commission

What are the opportunities for Malta?

- Located in the centre of the Mediterranean, the Maltese islands have been a major regional trading hub throughout their history. Moreover, a strategic location, a clear political commitment to ensure sustainable economic development, and a highly qualified workforce, has ensured that the country is increasingly respected as an attractive investment location.
- Malta's economy has seen significant transformation across the last 15 years, and its GDP has more than doubled across this period¹⁵. Over the last five years, Malta has been one of the fastest-growing economies in the eurozone. Malta's economy grew by 6.7% in 2018, making it the fifth year in a row in which real GDP has grown by over 5%. The outlook for strong growth looks set to continue, with real GDP growth forecasted to be 5.3% in 2019 and 4.8% in 2020¹⁶.
- Malta joined the EU in 2004 and became a member of the eurozone in 2008. It also transformed its economic focus, shifting from low-end manufacturing to an innovation-driven, service-based economy which is recognised as a leading global hub for financial and digital industries, with a re-dimensioned focus on industry aligned to advanced manufacturing, maritime and aviation service, together with significant growth in tourism, construction and real estate.
- The continued diversification of Malta's economy into new areas is important as the global economy continues to transform. Last year, the country became a pioneer in its creation of the Malta Digital Innovation Authority (MDIA), a regulatory authority responsible for governmental policies aimed at positioning Malta as a centre for excellence and innovation across digital technologies.
- The Government of Malta has taken a clear stance on technological innovation: it should be embraced, not stifled; Malta should be a disrupter, rather than a follower. In line with this commitment, Malta firmly established itself as a leader in new, up-and-coming areas such as distributed ledger technology (DLT) and gained global recognition as the "Blockchain Island". The country has now set out to establish itself in the fields of AI.
- AI solutions will enable companies to enhance operational performance and deliver better services to their customers. This is especially relevant in a tight labour market such as Malta's.
- Malta's key sectors are well suited to adopt AI solutions as companies look to innovate to provide competitive differentiation and drive operational improvements. Set out below are some examples of how AI is being used in these industries, either in Malta or globally:
 - **Financial services:** AI-driven based solutions are being used for intelligent financial planning, investment and money management services for consumers. They are also helping financial institutions create smarter credit and risk analysis applications and streamline operational performance.
 - **Gaming:** AI technologies are frequently incorporated into solutions to help detect and reduce fraud, enhance marketing effectiveness, and augment customer service interactions and customer experience functions.
 - **Advanced manufacturing and aviation maintenance, repair and overhaul industries:** AI-driven solutions are being deployed for condition monitoring and predictive maintenance activities. The solutions draw on the vast amount of data that aircraft, ships and machines now generate.
 - **Tourism:** AI models are being applied to big data to discover industry trends and sentiment (i.e. what tourists like and dislike) at scale, provide recommendations on places to visit and book, and enable hotels and vacation rental owners to deploy automated pricing solutions based on supply and demand.
 - **Real estate:** AI solutions are being used to increase the relevance of recommendations users see on websites, display personalised advertising, identify when new properties come on the market, and automatically tag and classify property photos and listings.
- Global technology companies are making significant investments in AI and opening new AI hubs in international locations; sometimes in partnership with universities, countries and cities. Companies and research organisations are actively seeking out high-profile use cases to pilot and showcase AI projects. National projects are highly attractive, and Malta's size makes it a viable test bed for pilot projects which can be run across an entire country.
- Malta can leverage its natural resources and size, as well as innovative public policy, to translate a bold leadership vision into a set of tools, incentives, resources and collaborative ecosystems that accelerate the journey from AI development to AI adoption, leading to commercial success, social benefit and international recognition.

¹⁵ Source: World Bank. GDP (current LCU). [online] Available at: https://data.worldbank.org/indicator/NY.GDP.MKTP.CN?locations=MT&most_recent_value_desc=false [Accessed 11 Aug. 2019].

¹⁶ European Commission (2019). Summer 2019 Economic Forecast – Malta.

- Countries have an opportunity to differentiate themselves through strong policy actions that address ethical, regulatory and legal dilemmas brought about by AI. Malta has taken a global lead by developing the world's first national AI certification programme. The certification process will largely be based on Malta's Ethical AI Framework, *Towards Trustworthy AI*¹⁷ and aims to provide applicants with valuable recognition in the marketplace that their AI systems have been developed in an ethically aligned, responsible and trustworthy manner.
- While a handful of large countries can out-invest and out-build others, the nature of AI development makes it possible for a single company or academic lab to put a small country on the map, even to lead and drive the agenda in one branch of AI.

Malta – Towards an AI Strategy

- In November 2018, the Parliamentary Secretary for Financial Services, Digital Economy and Innovation appointed the Malta AI Taskforce with the remit of advising the Government and developing a national strategy on AI (hereafter also referred to as the Strategy, the National AI Strategy and the Malta AI Strategy). The Malta AI Taskforce members include a diverse set of some of the country's best minds in entrepreneurship, academia, public policy, technology strategy, law and data science. Working groups were also formed to address the various areas of focus for the Malta AI Strategy.
- In March 2019, the Malta AI Taskforce published a high-level policy document, *Malta – Towards an AI Strategy*¹⁸. The document laid out the blueprint and the key areas of focus for the National AI Strategy.
- The Government's aim was to develop a National AI Strategy that focuses investment, resources and attention in ways that maximise the benefits for Malta and its contributions to the global economy.
- To realise this vision, the Malta AI Taskforce and working groups engaged with a broad spectrum of stakeholders, aiming to be inclusive and build awareness of the key topics and issues that should be addressed through the Strategy and formulate AI policies that are consistent with emerging international standards and norms around AI ethics.
- The comments received during the consultation were supportive of the direction and areas of focus set in the high-level policy document *Malta – Towards an AI Strategy*, and the national strategy has therefore built on these areas to set out a number of actions that will be achieved by 2022, together with actions to support a longer-term vision of where the country would like to be in 2030.

¹⁷ Source: Parliamentary Secretariat for Financial Services, Digital Economy and Innovation within the Office of the Prime Minister (2019). *Malta towards Trustworthy AI*, Malta Ethical Framework.

¹⁸ Source: Parliamentary Secretariat for Financial Services, Digital Economy and Innovation within the Office of the Prime Minister (2019). *Malta – Towards an AI Strategy*.



CHAPTER 2

VISION AND GOALS



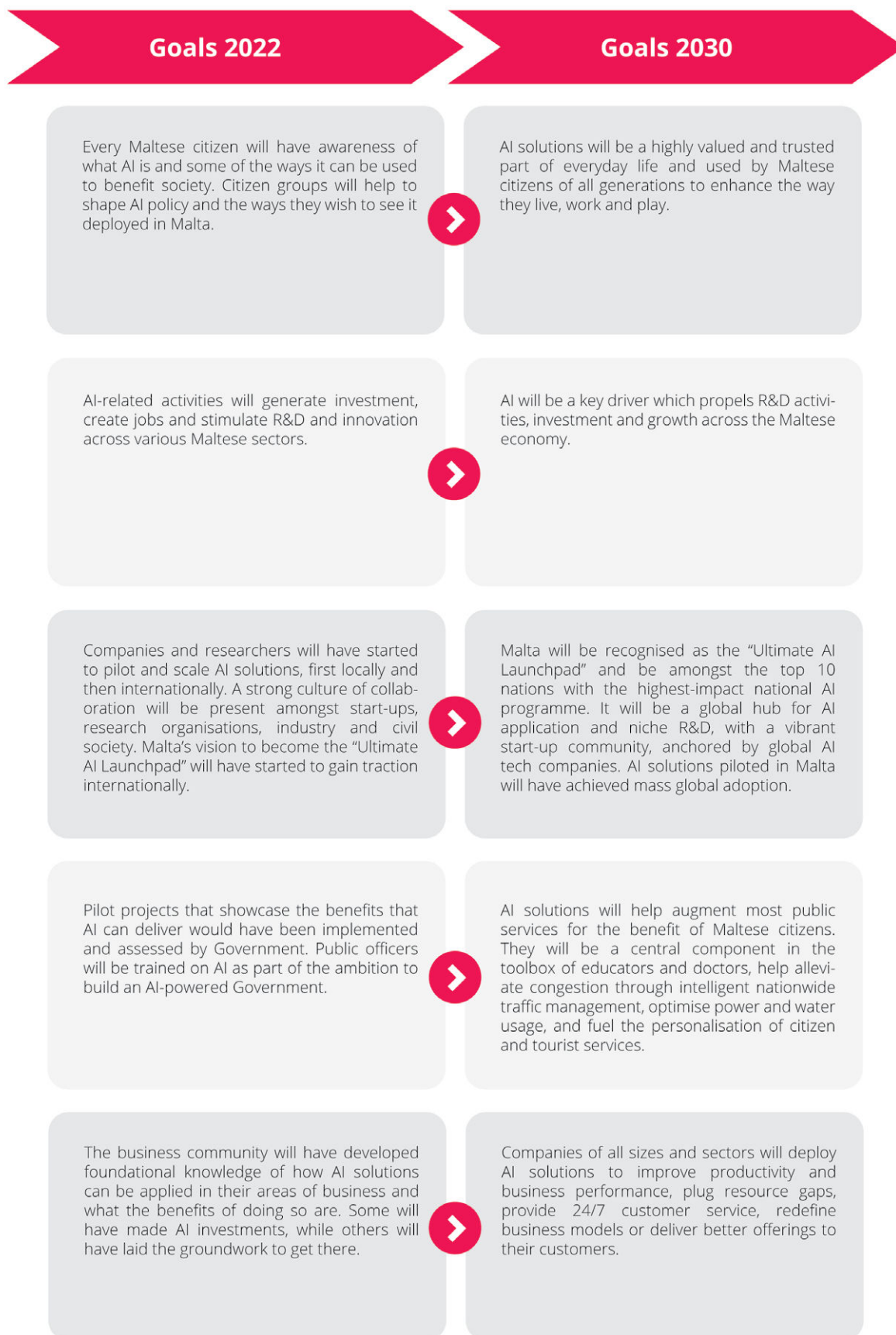
Malta – the “Ultimate AI Launchpad”

Malta aspires to become the “Ultimate AI Launchpad”- a place in which local and foreign companies and entrepreneurs can develop, prototype, test and scale AI, and ultimately showcase the value of their innovations across an entire nation primed for adoption. The ambition is to create the conditions for AI to springboard from Malta to the world.

Goals – where will we be?

The table overleaf sets out aspirational goals for Malta to achieve between 2019 and 2022 through the actions and policy measures detailed in the following chapters. The corresponding 2030 vision is the longer-term outlook of where Malta hopes to get to as it builds on the groundwork and actions of the Strategy.







Malta's benefits as a launchpad for AI

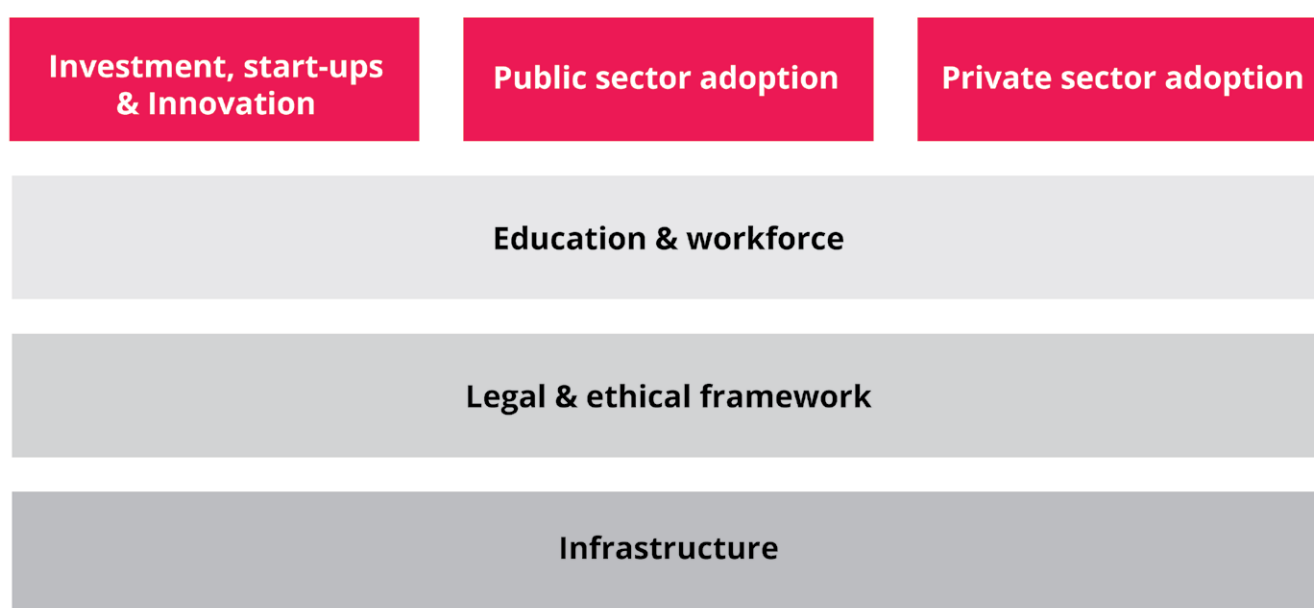
- With its small population of just under half a million inhabitants, the entire nation, rather than a town or city, becomes the ultimate AI pilot site.
- Malta is an EU Member State with a tech-savvy population, and English is one of the country's two official national languages.
- Its local laws and regulatory frameworks are specifically designed to promote the adoption and use of innovative technologies.
- The country has a strong and rapidly growing economy and a stable and business-friendly regulatory environment across telecommunications, gaming, financial services and fintech, which is conducive for trials and nurtures innovation.
- Malta's telecommunications infrastructure is amongst the most advanced in Europe, with high mobile and high-speed broadband penetration rates and 5G-ready infrastructure in place.
- The Maltese government is committed to creating the conditions for a robust local AI ecosystem, helping companies that invest in and serve Malta not only to establish their businesses but also to commercialise and scale. Public policy is also used to accelerate private sector adoption of AI.
- The Maltese telecoms regulator already operates a test-and-trial licensing scheme in support of innovative spectrum uses which aim to exploit Malta's unique potential as a test bed, both for technology tests and service trials involving third parties or the public.
- Leading global telecommunications companies have agreements in place with the Government to use the island as a test bed for digital technologies.
- Malta will look to set up a Regulatory Sandbox for AI to enable firms to explore and test concepts and solutions with proportionate safeguards, in a contained environment for a well-defined duration.
- The national data protection authority will also set up a Data Sandbox to support organisations that need to use personal data in the process of developing or testing innovative products and services in the specific area of AI.
- The country is keen to work with and collaborate with companies of all sizes, nations, international bodies and research organisations to accelerate the AI agenda.

Strategic pillars and enablers of the Strategy and Vision for Artificial Intelligence in Malta

AI is expected to have a transformative impact across multiple areas of society, government and business. *The Strategy and Vision for Artificial Intelligence in Malta 2030* therefore takes a holistic approach and aims to give due focus to the needs of various different groups of stakeholders as the country looks forward to achieving its vision.

The Strategy includes three vertical pillars which focus on boosting investment, innovation and adoption. It also includes three horizontal enablers that cut across the three aforementioned areas. Its wide-reaching nature ensures it is inclusive and does not leave any segment of society unduly burdened or left behind.

Strategic Pillars & Enablers



Strategy implementation and governance

- Effective governance will be critical for the successful implementation and achievement of the Strategy.
- Each action set-out in this document has been jointly developed with relevant stakeholders, who will now have responsibility to take them forward.
- The Malta Digital Innovation Authority (MDIA) will be responsible for the oversight and governance of the Strategy, in accordance with the functions vested to it under the MDIA Act. The MDIA will work with each stakeholder to agree on key implementation milestones and monitoring mechanisms for areas and actions they are responsible for.

CHAPTER 3

INVESTMENT, START-UPS AND INNOVATION



Investment, start-ups and innovation

Innovation is at the heart of the Malta AI Strategy. This is deeply interlinked with investment and economic activity from both local and foreign businesses, increased expenditure on Research and Development (R&D) and the creation of new start-up enterprises.

Establish the right conditions for Malta to become a leading centre for the application of AI solutions

- AI is a broad field with many branches and sub-branches. The limitless scope of application means that there are many niches that can be explored, showcased and championed. While Malta's inherent limitations make it challenging for the country to become a leader across every field of AI, it can be a model nation focused on excelling in the application of AI across specific fields.
- 01 The Maltese Government wants to collaborate with researchers, start-ups and companies that wish to use Malta to pilot and deploy AI solutions. It has created an interface for interested parties to submit a proposal and request a meeting with government officials at www.malta.ai.
- 02 The Government also will fund the development of a digital collaboration platform which will allow it, as well as research institutes and the private sector, to publish project profiles, collaboration requests, innovation challenges and requests for information (RFIs). Once complete, the collaboration platform will be the digital hub of Malta's AI activity, showcasing the volume of AI opportunities in Malta and facilitating opportunities for local and international start-ups, corporates and research organisations to tap into and work together.
- 03 The Maltese Government has placed the development of new emerging technological sectors such as AI as a national priority. Through Tech.mt, a public-private foundation tasked with promoting Malta as a leading global hub for emerging technologies, including AI, the Government will provide €1m per annum in funding to raise the visibility of the country's offering and promote Maltese AI businesses through various marketing activities, with participation in and sponsorship of leading global AI and tech summits in Malta and overseas.

Malta will seek to attract and develop talent, drive investment and incubate an innovation ecosystem that will allow the AI sector to flourish. Economic development has therefore been set out as a primary objective and key focus of the Strategy. The Government will look to nurture, attract and welcome companies of all sizes across all industries, from start-ups to scale-ups to established global tech leaders.

Increase R&D activity in Malta

- R&D is a major driver of innovation and helps new products and services to be brought to the market. Malta is taking a multi-pronged approach to increase R&D intensity as a key focal area of the National AI Strategy.
- 04 In 2019, Malta introduced a Patent Box Regime (Deduction) enabling qualifying beneficiaries to benefit from a deduction against taxable income or gains of up to 95% of the gross revenue from its qualifying intellectual property (IP) assets. This measure is expected to significantly strengthen Malta's positioning as the "Ultimate AI Launchpad" and stimulate AI related R&D activities in the country.
- 05 The country will also invest to strengthen its AI research capabilities at two of its public higher education institutes, the University of Malta (UoM) and the Malta College of Arts, Science & Technology (MCAST), to increase academic and applied research output and drive greater collaboration with industry and international partners. Further details on these initiatives are provided on p.41.
- 06 Financial support will be provided for AI-related research commercialisation programmes and technology development (including financial support for research, development and innovation) in Malta's areas of Smart Specialisation (ICT as an Enabler, ICT Based Innovation, Tourism Product Development, Aviation and Aerospace, Health, Resource Efficient Buildings, High Value-Added Manufacturing, Aquaculture) through the Malta Council for Science and Technology (MCST) R&I FUSION Programme until 2020. The annual budget currently allocated to the R&I FUSION Programme is €2.2m.
- 07 Malta Enterprise, the Economic Development Agency of the Maltese Government, has launched a set of incentives which aim to support companies of various sizes in R&D and innovation activities. These measures include financial assistance (in the form of tax credits) to undertake R&D projects; employ those holding or undertaking doctoral degrees; and support SMEs in temporarily engaging highly qualified personnel from large businesses and research organisations for specific projects.

- Malta has invested heavily in infrastructure and legislation to be well positioned to become a leader in health-related AI research. The country's health information system is fully centralised and its Directorate for Health Information and Research (DHIR) holds extensive registers and data repositories (most dating back 10 or 20 years) with set variables around specific diseases or life events. The unique records permit linkage between registers and public datasets to create an infinite combination of data variables which are anonymised or pseudonymised for release to third parties for public interest research purposes.

08 The government will shortly introduce a new legal notice which regulates the secondary processing of personal data in the health sector, as allowed for and specified within the General Data Protection Regulation (GDPR), for matters pertaining public health, health services management, health statistics and research. The legal notice lays out conditions and safeguards and provides for a clear approval mechanism for health research through Malta's Health Ethics Committee or any other Ethics Committee recognised by the Information and Data Protection Commissioner.

Support entrepreneurs to establish AI-related business ventures and scale

- Start-ups bolster the business community, drive innovation and R&D, stimulate competition and introduce new products, services and business models into the market. Yet starting a new business is not easy, and entrepreneurs often need support to get their business off the ground. The Maltese Government will therefore be implementing a series of policy actions to catalyse, synergise and boost start-up activity in the country.

Accelerators

09 The Government will seek to partner with an internationally renowned start-up accelerator to run a programme in Malta. The initiative is expected to provide participants with seed investment, connections, mentorship and hands-on support to build business, product and fund-raising strategies. The programme will conclude with a demo day, where participants will have the opportunity to pitch their business to investors who can help accelerate their companies' growth. Applications are expected to be open to both local and foreign companies focusing on AI and other emerging technologies.

10 YouStartIT, a well-established, early stage accelerator programme run by the MITA Innovation Hub, will be given additional funding to run a thematic AI-based programme, thereby increasing its cohort to two programmes per year. As part of its offering, it will provide zero-equity investments (seed capital grants) to help early stage start-ups to validate and develop proof of concepts for AI-based ventures.

11 The TAKEOFF Seed Fund Award (TOFSA) will be given additional funding to support AI ventures over and above its current allocation. TOFSA is a joint initiative between the Ministry for the Economy, Investment and Small Businesses, the University of Malta (UoM) and its Knowledge Transfer Office, TAKEOFF Business Incubator and the Centre for Entrepreneurship and Business Incubation, which provides seed funding to researchers and entrepreneurs. Under the programme, TOFSA awards funds through a two-step process, whereby the best-written applications are shortlisted for a live pitch in front of a panel of judges, with the top applicants receiving funding.

Funding

- Access to finance remains a key challenge for many businesses across their early growth stages, and the business angel and venture capital market in Europe, and more so in Malta, is underdeveloped compared with leading global markets.

12 The Government will therefore look to establish an investment fund to provide equity-based risk capital to Maltese start-ups and scale-ups. It is envisaged that:

- All investments will be structured through co-investments¹⁹ with private investors who will participate alongside the Government on equal terms and conditions
- Co-investments will only be undertaken with qualified business angels, venture capitalists, venture funds and private equity houses that have gone through an extensive screening and due diligence process to gain accreditation for the scheme
- The involvement of the private sector as co-investors will create a multiplier effect in terms of the volume of funding available, and also help to increase deal flow and decrease investment risk and transaction costs.

13 The Government will also look to update the rules of the Seed Investment Scheme, which provides tax credits to investors in return for investment in a qualifying Maltese start-up or early stage company. The changes being considered include:

- The removal of certain restrictions relating to the type of qualifying activities
- Wider company characteristics parameters to make the scheme accessible to later stage start-ups and scale-ups
- New investor eligibility criteria to make it possible for companies and collective investment schemes to avail of similar tax benefits

¹⁹ Note: Co-investment is defined as any form of public equity investment (up to 50%) in private companies alongside a partner organisation of qualified investors (such as VC funds or business angel networks), excluding direct public investment in VC funds and funds of fund. (European Commission, 2017).

14 Malta Enterprise has launched various incentives schemes which can finance innovative AI undertakings with a viable business concept in their early stages of development. The incentive schemes will run through 2019 and 2020 and may be extended to the following years. Assistance includes:

- Seed funding grants of up to €25,000 under Business START (B.Start). The total budget available for this scheme is currently €1m per year.
- Repayable advances structured as a mezzanine finance instrument to support start-ups with a proven business concept undertake initiatives linked to raising equity investment from third parties, procuring equipment and crowd-funding. Typical support is in the range of €200,000 and advances are repayable over a number of years.

Capital gains tax relief on exits

15 The Government will consider introducing a change to Malta's tax legislation to reduce/eliminate capital gains and duty on document on the transfer of shares. The proposed changes are expected to incentivise more entrepreneurs to start businesses, reward them for their successes and stimulate re-investment into other business ventures, thus driving further economic activity and employment.

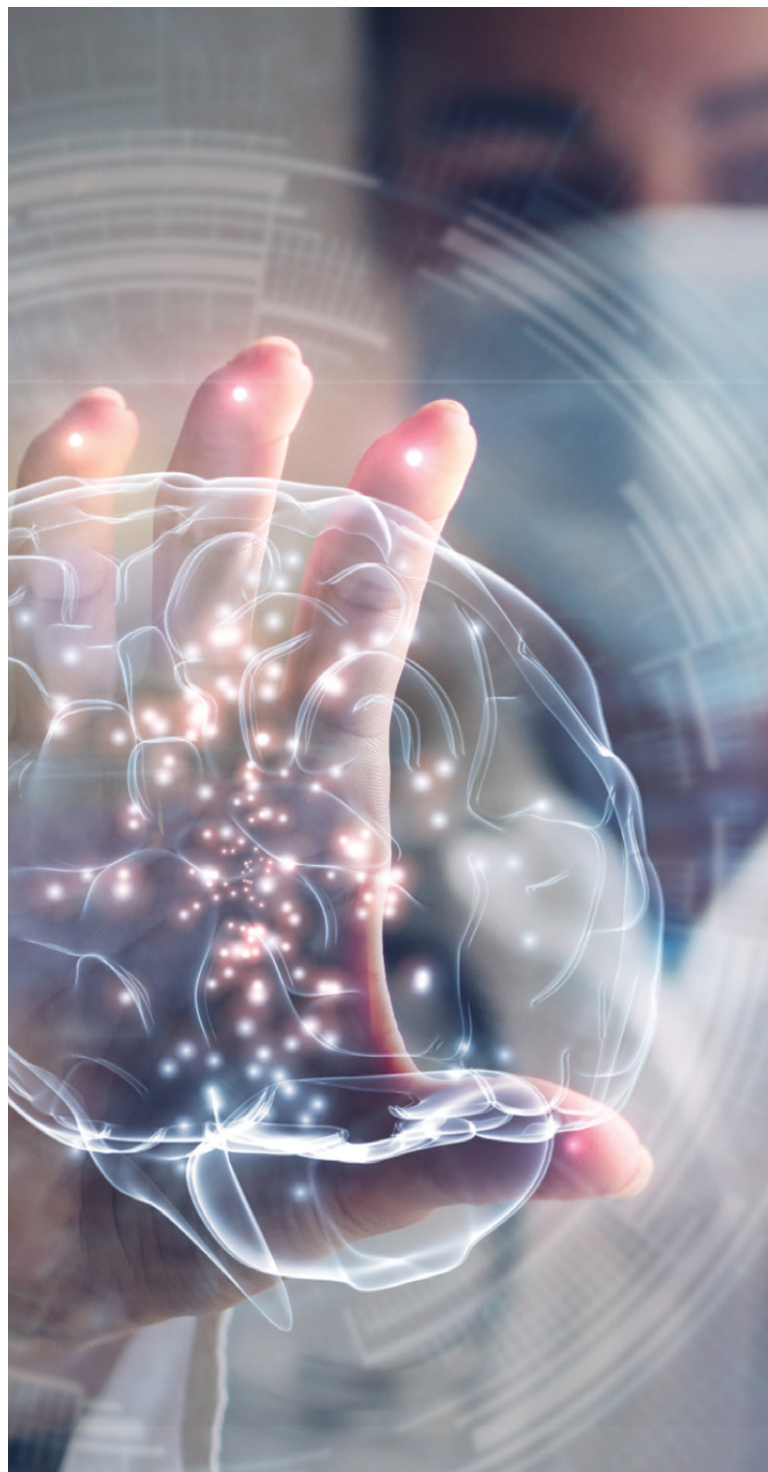
Attract international talent, entrepreneurs and investors to Malta

- Malta wishes to position itself as a leading hub for global start-up activity. The country already has a sizeable number of foreign entrepreneurs, companies and workers in digital and knowledge-based industries, mostly from the EU countries of Sweden, the UK, Germany, Italy, France and Spain. Malta will now implement further measures to:
 - Make it easier for non-EEA nationals looking to set up or invest in business locally
 - Incentivise workers with specialised skills that are in high demand both locally and globally to move to Malta

16 Malta will launch a "Start-up visa" for aspiring entrepreneurs who intend to develop an innovative business in Malta. Applications will be assessed on the strength of the business plan submitted, without any capital investment requirements. The visa will provide a simplified, fast-track procedure for start-up founders and their families from outside of the EU and the European Free Trade Area to reside and work in Malta, subject to the satisfaction of appropriate background checks on the applicants. A mechanism provides for temporary, then permanent, residence permits to be obtained subject to the fulfilment of certain requirements.

- Malta's Key Employee Initiative provides third-country nationals who will be employed in a managerial or highly technical post at a salary above €30,000 per annum with a fast-tracked, single permit for work and residence to be processed within five working days. The scheme is available to individuals working in the field of AI who meet these criteria.

17 The Government will shortly re-introduce the Qualifying Employment in Innovation and Creativity (Personal Tax) Scheme. This incentive provides qualifying employees who work in wide range of AI-related roles, including industrial research and experimental development, product development and product and process innovation, and earn over €52,000 per annum to benefit from a reduced flat rate of personal income tax at 15% for a three-year period.



CHAPTER 3

PUBLIC SECTOR ADOPTION



Public sector adoption

AI can play a transformation role in the way public services are delivered, national resources are used and infrastructure is deployed. It also has the potential to make government more efficient, thus improving internal operations and governance, and leading to better use of taxpayers' money.

In June 2019, the Maltese Government launched *Mapping Tomorrow*²⁰, a strategic plan for the digital transformation of the public administration. In his foreword, Mr. Mario Cutajar, the Principal Permanent Secretary, states: "We cannot just address the present situation; we need to have foresight to look ahead beyond the present and into tomorrow... We are looking at how best to embed artificial intelligence capability into business processes and how to adopt other emerging technologies to achieve services of excellence... Our aim is to have a Digital Public Administration that is continuously renewing itself, transforming the way citizens and business interact with government and providing public services of excellence."

AI can improve almost everything a government does and provide new choices in the way services are delivered. Various AI technologies have already reached a level where they can deliver significant tangible benefits today, with those that it could deliver in the next few years potentially being much larger.

The Government aims to stimulate and catalyse AI adoption in Malta and will implement a series of actions across the next three years to turn this vision into a reality, including:

- Creating an AI-powered Government
- Implementing high-profile pilot projects to:
 - Provide better services to citizens/businesses
 - Improve the economic and social well-being of citizens/businesses
 - Improve the internal operations of the public administration
- Implementing policy actions to encourage procurement of smart technology-based solutions

Create an AI-powered Government

18 The Government will look to explore how AI can be deployed across each area of government and public administration. The responsibility for carrying out these actions shall lay with the respective Ministries' or state-owned entities Chief Information Officers (CIOs).

19 An awareness campaign will be launched for public officers to build capacity, knowledge and understanding of what AI is, why it is important, and the benefits of public sector adoption. The awareness campaign will consist of:

- An internal communications campaign, targeted to all public sector officials, to commence following the launch of the National AI Strategy
- A series of awareness events between 2020 and 2021 to equip public officials with foundational AI knowledge and insights into projects being undertaken by the Maltese Government
- Events for all senior officials in the public sector to build deep insight into the Government's AI strategy and implementation plan, public sector AI projects, and local and global developments

20 The public service training curricula will be updated in 2020 to include AI-related courses. AI training courses will commence in 2021. Furthermore, financial support will be made available to public officers wishing to obtain external certification and qualification in AI-related areas.

21 The public administration will accelerate the use of AI technologies across citizen services and internal administration through:

- The development of a guidance document to highlight AI use case applications within the public administration and a checklist to reference when developing project proposals
- The drafting of technical policy statements to assist in the adoption of AI for government services
- The formulation of a Technical Committee to review architecture of solutions to be implemented within Public Administration, particularly with regards to the adoption of AI

22 In 2017, Oxford Insights created the world's first Government AI Readiness Index to answer the question: how well placed are national governments to take advantage of the benefits of AI in their operations and delivery of public services? The 2019 Government AI Readiness Index, produced with the support of the International Development Research Centre (IDRC), sees a development of this methodology and an expansion of scope to cover all UN countries (from our previous group of OECD members). It scores the governments of 194 countries and territories according to their preparedness to use AI in the delivery of public service. Malta was ranked 43rd in the 2019 Government AI Readiness Index. As part of the Strategy, the Government will monitor Malta's performance in the AI Readiness Index and commission work to identify and implement measures to improve Malta's standing.

²⁰ Source: Office of the Principal Permanent Secretary (Office of the Prime Minister) and the Malta Information Technology Agency (MITA) (2019). *Mapping Tomorrow: A Strategic Plan for the Digital Transformation of the Public Administration 2019 – 2021*.

Encourage the procurement of smart technologies

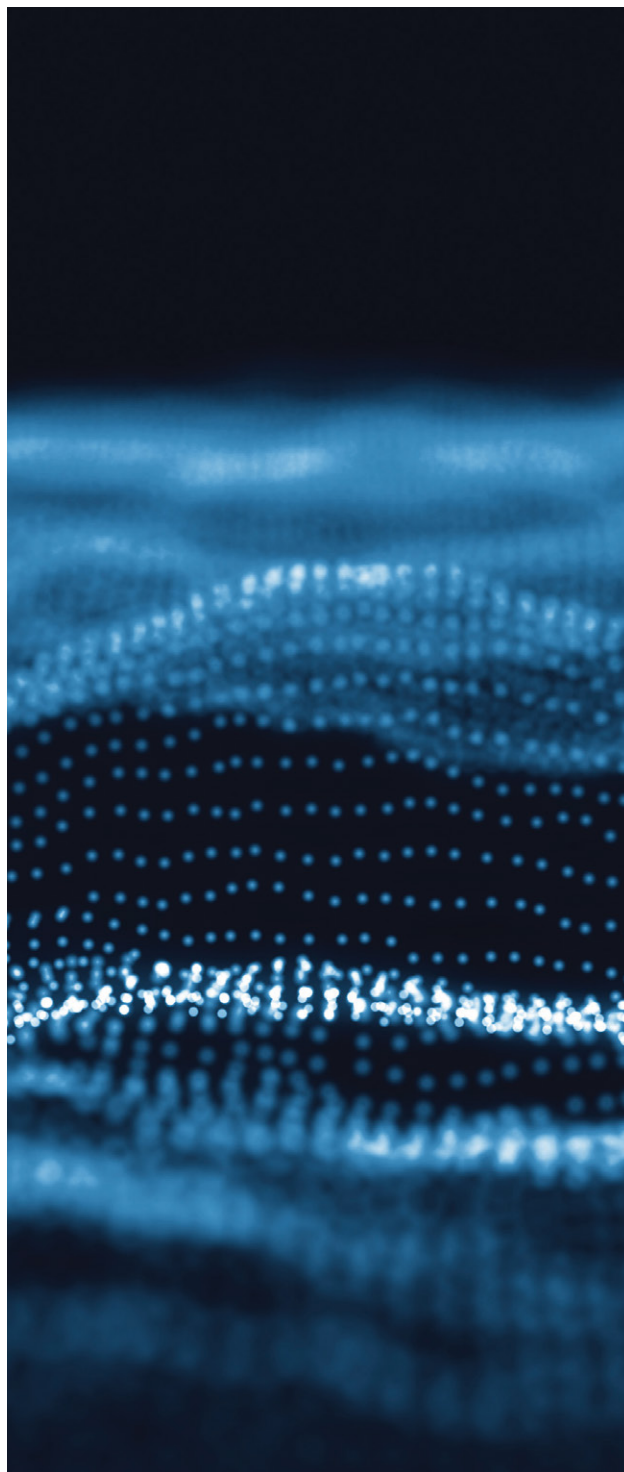
23 The Government will also develop various policy measures that support the public procurement of emerging technologies solutions, including:

- The launch of a new business case template which requires business owners to put forward a request for technology procurement to document whether emerging technologies have been considered – and if not, why. Business cases that align to national digital strategies, such as the Malta AI Strategy, will be prioritised.
- Enacting a training and awareness programme to build capacity and knowledge and to equip public administration procurement teams with insight into AI technologies, AI procurement frameworks such as the one currently being developed by the World Economic Forum²¹, and pre-commercial procurement methods.

Implement high-profile AI pilot projects

- The Malta.AI Taskforce and its Working Group for Public and Private Sector Adoption, in consultation with the Public Administration, have identified six AI pilot projects that will be undertaken and implemented by 2022 as part of the Strategy.
- Each of these projects is expected to have a profound and positive impact across a large section of society and will play a key role in raising the visibility of the tangible benefits that AI can deliver to society and business. Each of the projects will also demonstrate Malta's commitment to using AI to tackle the UN's Sustainable Development Goals (SDGs).
- The MDIA will monitor that each pilot project gets implemented by the respective business owner.
- A detailed assessment will be carried out following the conclusion of each of the pilot projects to determine the viability of a wider roll-out of each project at scale.

- The following actions determined which projects would be taken forward:
 - A long-list of AI use cases was identified and assessed against various criteria by members of the Malta.AI Taskforce and its Working Group for Public and Private Sector Adoption, with additional stakeholders from industry, government and academia invited to participate in the process.
 - The respective business owners from government were then invited to participate in a series of workshops and meetings where the detailed AI projects were jointly developed with the support of the Malta.AI Taskforce's Working Group for Public and Private Sector Adoption and additional stakeholders.



²¹ Source: Department for Digital, Culture, Media and Sport (2019) website. How the public sector can procure AI-powered solutions more effectively and responsibly. [online] Available at: (Accessed on 20 June 2019) <https://dcmsblog.uk/2019/07/how-the-public-sector-can-procure-ai-powered-solutions-more-effectively-and-responsibly/> [Accessed 20 Jun. 2019].

Malta's pilot projects - AI for traffic management

24 Self-driving vehicles are regarded as a shining example of how much AI can transform the way we live. However, it could be at least two to three decades before we see a widespread roll-out on Maltese roads. Of more immediate use is the way AI can be used by traffic planners and controllers to reduce congestion, route traffic and improve road safety.

Pilot projects to use AI to optimise traffic light control and waiting time flows have already been undertaken in various international locations, including the US, the UK, Germany and Singapore. A company running a project on 50 intersections in Pittsburgh, US, claims to have reduced waiting times by up to 40%, journey times by 25% and vehicle emissions by up to 20%. In Hagen, Germany, AI-optimised traffic light control deployments suggest intersection waiting times can decrease by about a half compared with a traditional pre-timed signal plan.

Algorithms can power journey planner applications to suggest the best routes, methods of transport and the expected time needed to reach destinations. More data enables these applications to provide more accurate suggestions and predictions.

This project will explore how AI can be incorporated into Malta's traffic control systems and geographic information systems (GISs) to:

- Reduce congestion and emissions
- Identify patterns in transport behaviours
- Deliver insights to enable intelligent journey planning and scheduling of public transport
- Create intelligent private journey routing (in conjunction with third-party applications)
- Assist with monitoring, policing and enforcement

A mobility analytics dashboard will be developed to generate location intelligence across different modes of transport in real time and leverage big data derived from Malta Public Transport (MPT) data and other sources.

The proposed project will consist of three parts that will be undertaken across a three-year period:

- **Part 1:** A pilot project to deploy an AI engine to manage traffic flow on one key junction. The solution will use existing video feeds to detect the number of vehicles on the road, then the AI software will process this information and control the traffic lights to keep traffic flow moving in the most optimal way, with a manual controller retaining oversight for safety purposes.
- **Part 2:** The enhancement of Malta's GIS system by connecting new data feeds to the current system and making the information available to third-party, AI-enabled, journey planner and mapping applications. This will improve the accuracy of journey planning and provide real-time tracking of public transport through the development of a mobility analytics dashboard.
- **Part 3:** A detailed study on the potential for widespread AI enhancements to be incorporated in Malta's traffic management system.

“ A mobility analytics dashboard will be developed to generate location intelligence across different modes of transport in real time and leverage big data derived from Malta Public Transport (MPT) data and other sources. ”

Business owner: Transport Malta
Ministry for Transport, Infrastructure and Capital Projects



Malta's pilot projects - AI in education



25 AI promises to enhance education at all levels, especially by providing personalisation at scale. The Ministry for Education and Employment (MEDE) has a wide-reaching vision for how AI can support its priorities and continuous improvement. The vision draws from the Framework for the Education Strategy for Malta 2014-2024, which focuses on the learner's educational journey. Given the sensitivities of trialling new technologies in a sector as important as education, priority will be given to student and parent engagement throughout this initiative.

The main objectives of this strategy are to:

- Reduce the gaps in educational outcomes between boys and girls and between students attending different schools; decrease the number of low achievers and raise the bar in literacy, numeracy, and science and technology competence; and increase student achievement
- Support educational achievement of children at risk of poverty and from low socio-economic status and reduce the relatively high incidence of early school-leavers
- Increase participation in lifelong learning and adult learning
- Raise levels of student retainment and attainment in further, vocational and tertiary education and training

Looking ahead, it is foreseen that the introduction and implementation of AI will assist administrators and educators to provide individual and adaptive learning experiences to students and predict analytical trends to make informed decisions and issue relevant policies to achieve the targets set within the education strategy.

The proposed project will consist of two parts that will be undertaken by 2022:

- **Part 1:** A pilot project to develop an AI-powered adaptive learning system to help students achieve better education outcomes through personalised learning programmes based on student performance, ambitions and needs. The pilot will also help teachers to build more formative assessments of the pupils' capabilities. The project will be piloted with 50 educators and 1,000 students across primary and secondary education.
- **Part 2:** A pilot project to construct a rich data set and use AI to assist in driving insights and actions to enhance the education system. The initial project will focus on delivering predictive insights to assist in identifying early school-leavers to help educators take preventative actions to drive better outcomes.

The MEDE will ensure student and parent participation in the development, testing and deployment process, ascertaining that these important stakeholders in this initiative fully appreciate its benefits and the experimental nature of the pilot project, and have a meaningful route by which to make their concerns known.

Business owner: Department of Learning and Assessment Programmes
Ministry for Education and Employment

Malta's pilot projects - AI in healthcare

26 The increased availability of data and recent advancements in AI could present unprecedented opportunities in healthcare which create value for citizens, providers and regulators. As AI and deep learning enter the mainstream of clinical medicine, these technologies have the potential to complement and support healthcare professionals in enhancing the quality, efficiency and performance of healthcare, and break new frontiers in biomedical research.

Through AI technologies, healthcare professionals may be able to make better, quicker and more accurate decisions across diagnosis, treatment and care to improve patient health outcomes and increase the efficiency and sustainability of healthcare systems.

Malta's vision foresees AI being deployed in the future to:

- Prevent disease within its population
- Optimise the care trajectory for patients with common chronic conditions
- Develop and apply precision therapies for complex illnesses
- Reduce adverse events
- Accelerate biomedical research

The data-heavy nature of healthcare makes it one of the most exciting frontiers in AI. Malta has made significant investments to become a leader in the digital health space and one of the best countries to undertake health-related AI pilot projects.

The Pharmacy of Your Choice (POYC) repository captures entitlement, prescription and dispensing data for over 143,000 active patients with chronic conditions. It has been maintained over a period of 10 years and now includes a wealth of information on the local population, including deceased persons, the prevalence of and shifts in chronic conditions, and the treatments provided in this regard. This is in addition to full demographic data, as well as data on related prescribing and dispensing practices and practitioners.

The pilot project to be undertaken will explore how the application of AI on top of the POYC platform can:

- Assist prescribers to make more informed decisions from a patient safety perspective
- Perform predictive analysis to drive cost savings in procurement spend
- Devise preventive care models at both the macro and micro level to create better health outcomes

The use of data to deliver more effective and less costly healthcare is central to the Malta's Digital Health Strategy. The Ministry for Health is currently laying the technical, semantic and legal foundations for public health data to be collected, stored and made available for consumption in a standardised, structured and secure manner through the implementation of a National Electronic Health Record (NEHR) system. The NEHR project is underway and expected to go live by the end of 2021. It aims to generate better-informed decisions by health professionals and ascertain continuity of care for patients.

“The data-heavy nature of healthcare makes it one of the most exciting frontiers in AI. Malta has made significant investments to become a leader in the digital health space”

NEHRs are expected to create the perfect environment for curated, context-rich data, on which AI can be deployed to process large amounts of complex, interrelated health information in the most efficient and effective manner possible. This will be ever more important when large genomic data sets become mainstream and/or if indirectly linked data sets, such as those pertaining to the social determinants of health, are fed into machine learning models.

The Ministry for Health is committed to building trust in these new systems by keeping patient welfare and safety at the forefront, while working to ensure data privacy, transparency of algorithms, data standardisation and interoperability across multiple platforms.

Business owner: Pharmacy of Your Choice (POYC)
Ministry for Health

Malta's pilot projects - AI for customer service

- 27 Many public and private sector organisations across the globe are using intelligent chatbots and similar AI-driven solutions in call centers and customer service functions to augment and enhance their human-led services.

The servizz.gov platform is the central point of information for all government services. Citizens and people living in Malta make use of servizz.gov through various channels, including email and telephone. When receiving any form of query regarding government services, assigned agents refer to the service catalogue and other online resources to gather information to draft an answer.



“ Processing clients' requests quickly, efficiently and as accurately as possible is of paramount importance. ”

Processing clients' requests quickly, efficiently and as accurately as possible is of paramount importance. The project will explore how applying AI into the servizz.gov customer service workflow can drive performance enhancements across each of these areas.

The project will consist of the phases below, with the first to be completed by 2022:

- The first phase will focus on the back office. An AI-driven email assistant will be created to assist servizz.gov agents, analyse citizens' email queries automatically and provide the assigned agent with a suggested reply automatically. The agent will then use the suggested reply as a basis for the official final reply to the citizen, to minimise the time taken to reply to queries. A human agent will check and control the quality and content of the reply email, and the changes will be monitored by the AI system so that it continues to learn how to better formulate reply emails. However, the final say is that of the human agent.
- Later phases of the project envisage the development of a chatbot, which will use AI to initially determine how citizens can best be directed to obtain the information that they are seeking. The long-term strategy is to include voice assistance over the telephone, with the same principle of an AI system that is able to communicate and help customers with their queries, but in this case using the voice medium.

All these services will be developed in both English and Maltese so that servizz.gov can serve clients in their preferred language. Furthermore, as an additional long-term strategy, it is envisaged that servizz.gov will be able to use machine translation services to communicate clearly with foreign nationals living in Malta in their preferred language.

Business owner: servizz.gov
Office of the Prime Minister

Malta's pilot projects - AI in tourism

28 The Ministry for Tourism, with the Malta Tourism Authority (MTA), has commissioned the development of the Digital Tourism Platform, which will launch in 2019. It aims to enable Malta to deliver better tourism experiences through technology by obtaining and leveraging valuable insights from data. The project will see the launch of interactive information kiosks in the main tourism areas and the creation of digital applications to provide tourists with the information they need.

As a next step, AI will be incorporated into the Digital Tourism Platform to enable the development of rich tourist personas, which combine psychological characteristics, such as interests and lifestyle choices, with demographic data. Machine learning will enable the platform to create deeper and smarter personas as it collects more data. From this information, the Digital Tourism Platform will be able to:

- Suggest itineraries and experiences for tourists matched to their interests, similar to recommendation engines commonly used by digital music and television streaming services and social media
- Create propensity models based on predictive analytics to forecast where a tourist will go and which tickets they may purchase, and use that information to recommend suggestions, via targeted promotional notifications within the app, to balance loads and minimise queues. Subsequent phases of the project could see wider data sets, such as those from IoT sensors on bus stops and tourist attractions, incorporated into the platform to drive smarter, just-in-time recommendations.

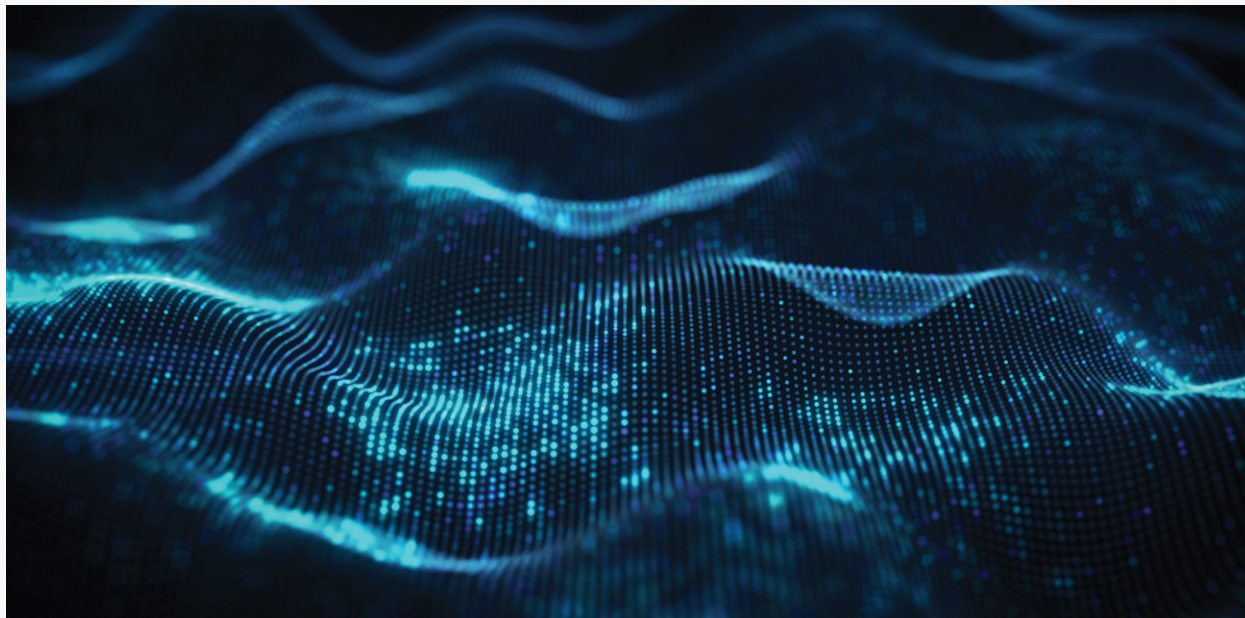
Building on this initiative, the Government plans to launch an Environment Passport initiative. The Environment Passport will provide VisitMalta+ app users with information and advice to make their visit more environmentally friendly and offer them rewards, such as discounted attraction admission fees, for undertaking environmentally friendly actions.

Other measures to incorporate technology into Malta's tourism offering are also underway. These include the development of virtual experiences in museums and sites, using augmented reality (AR) to enrich the visitor's experience and knowledge of the attraction and create a more immersive dimension. The project will also enable the MTA to set up a roaming virtual reality (VR) experience which will be used in overseas fairs when marketing the Maltese islands.

**Business owner: Malta Tourism Authority
Ministry for Tourism**



Malta's pilot projects - AI for better utilities



29 The utilities sector, especially the energy sector, is expected to undergo a profound transition over the coming decade. Renewable energy generation is expected to increase significantly, driven by technological enhancements and a drive at national, European and global levels for more green energy. Demand is also expected to increase, along with the number of electric vehicles on the road, with more viable battery technology and greater roll-out of electric vehicle charging points. These shifts will require new capacity from the grid and improvements in the system resilience of Malta's energy supply.

The utilities sector can benefit significantly from the introduction of AI – it can be used to automate manual processes, enable the interpretation of collected data, facilitate load distribution optimisation in accordance with live demand and supply, and enhance maintenance and performance.

Malta's national utility companies, Enemalta, Water Services Corporation and ARMS, are collecting huge amounts of raw data in both structured and unstructured form. The sheer scale of the available data and its rapid rate of change make it difficult to process using traditional database and software techniques. Machine learning algorithms running on local or cloud-based high-performance computing systems can provide the capabilities needed to improve operations and make faster, more intelligent decisions.

A pilot project will be undertaken where:

- AI algorithms will be used to collect, organise and analyse current data to discover patterns and other useful information relating to water and energy usage. The solution will deploy large-scale analytics and machine learning on customer data to help the utility companies to maximise resources and subsequently provide responsive real-time customer service management. Concurrently, they have the ability to make real-time adjustments to attain optimised generation efficiency.
- Predictive maintenance models and scenarios will also be developed. Data from various sources, such as historical maintenance records and sensor data from the network, will be used to facilitate the implementation of solutions which identify problems before they occur, reducing the need for the current time-intensive manual inspections.

The project is expected to drive better efficiency, resilience and stability across Malta's energy and water networks, and lay the foundation for the next evolution of its smart grid network.

**Business owner: Information
Management Unit**
Ministry for Energy and Water Management

CHAPTER 5

PRIVATE SECTOR ADOPTION



Private sector adoption

Private sector technology giants have swiftly brought AI into daily life through the applications they have developed. Algorithms used across search, social media, digital advertising and e-commerce recommendation engines are some of the most widespread examples. Whilst these applications are broadly used by businesses across the globe, there is an opportunity for private sector enterprises to do so much more with AI.

The Government is looking to take an active role in stimulating broader AI adoption across the local private sector. It aims to set out a clear AI vision, direction and strategic priorities to guide private sector interest. Furthermore, it aims to help shape and accelerate private sector AI adoption through several measures listed below.

Build awareness of what AI is and how it can be deployed

- The Malta.AI Taskforce's Working Group for Public and Private Sector conducted a survey²² amongst private enterprises in Malta to gauge awareness of what AI is, their interaction with AI technology, comfort with AI, plans and challenges related to AI deployment, and the areas in business where they would feel comfortable with AI being used.
 - The research highlights the need to build awareness of what AI is and how it can be deployed, especially amongst SMEs. The key findings showed that:
 - Roughly half of respondents at companies surveyed did not have the correct understanding of what AI is
 - Only 50% were aware that they had ever interacted with an AI device; however, when made aware of some common AI applications, over 95% indicated that they had used one of these services over the last year
 - One-in-five business already uses AI technology, while a further quarter would do so in the coming years
 - Professionals not having the appropriate knowledge and skills, or with uncertainty about how to apply them, were stated by businesses as the biggest challenge to deploying AI solutions across their organisations
- 30** Various awareness activities will be undertaken which aim to build knowledge and encourage dialogue with private businesses. The activities will include:
- A national AI publicity campaign to build AI awareness and knowledge, dispel myths and misconceptions, and generate awareness of stimuli (funding schemes and fiscal incentives) to support AI adoption

- A series of public workshops to facilitate two-way dialogue between AI experts and industry
- The development of sector-focused materials which aim to highlight how AI can be used across different business activities in the related industries
- In consultation with the Malta Council for Social and Economic Development (MCESD), government will encourage trade unions, industry representatives and employers' associations to run sector-focused seminars to explore how SMEs can utilise and benefit from AI tools
- A public workshop, organised by the UoM, which will explore how private companies can collaborate with academia to develop AI solutions

Identify readiness of the private sector to adopt AI

- 31** Companies need a baseline level of digital maturity in order to adopt AI at scale. To help local companies understand and close gaps in their organisation and technology infrastructure that impede AI adoption, the Government will commission the development of an AI readiness toolkit, which will be used to help businesses understand where they are on their AI journey and provide practical advice to help them progress. The toolkit will contain:
- An AI maturity and readiness assessment tool
 - Information on various AI technologies
 - Information on how AI can be applied to different areas of business and sectors (use cases)
 - Guidance to accelerate AI adoption
- 32** The Government will also develop and launch a Private Sector AI Readiness Index and publish the findings on an annual basis.

²² Note: The survey was conducted between June and July 2019 across a sample of private businesses that is representative of business size classification and sector of private businesses operating across the Maltese economy.

Help local businesses to incorporate AI into their business

- The Government will focus on designing measures that enable companies of all sizes to use, develop and integrate AI applications in the way they work and the way they do business. These include:
- **33** The development of support measures to help entities to carry out in-depth AI readiness assessments, an upgrade to industry 4.0, a review of business processes, and implementation of AI-based solutions
- Investment in the development of Maltese language tools to support AI-driven understanding and generation of Maltese text and speech to catalyse the deployment of AI solutions by industry (further information on this measure is provided on p.48)
- The creation of Digital Innovation Hub for businesses to access technological expertise, advice and insight into industry practices (further information on this measure is provided on p.50)
- Training programmes and financial support measures to help business owners and employees to develop AI-related skill sets (further information on this measure is provided on p.39)

Build trust in how AI works in terms of transparency and accountability

- The willingness and openness of private sector clients and consumers to use AI solutions in the way they are serviced will have a big role in dictating the pace of adoption. Malta has recently developed an Ethical AI Framework, Towards Trustworthy AI, which sets out Ethical AI Principles, Trustworthy AI Requirements and Control Practices for AI development and use which are ethically aligned, transparent and socially responsible (further information on this measure is provided on p.45).



CHAPTER 6

EDUCATION AND WORKFORCE



Education and workforce

Malta is predominantly a service-based economy that relies on quality human capital delivering high-value-added services. The Government recognises the critical function provided by the working population, as well as the education system in Malta, which provides the fundamental function of sustaining current and future generations of trained and educated people.

At the same time, the onset and widespread adoption of AI is expected to disrupt current work practices and functions at a broader level and create both opportunities and skills gaps. The education system and workforce implications are therefore deeply intertwined elements of Malta's AI Strategy.

As highlighted in the introductory section of this document, various studies have been undertaken by academics, research institutes and government bodies on the potential

impact that automation will have on the workforce, but there appears to be little consensus on both the number of jobs at high risk from automation and the number of new jobs that are expected to be created by the technology.

However, a few common themes are prevalent:

- AI will drive big changes across all economic sectors: "New jobs will be created, others will disappear, most will be transformed"²³
- The pace of change will play out differently across countries, sectors and roles
- The workforce will need to acquire new skills and adapt their ways of working as AI becomes more widespread

Understand and plan for the impact of technology and automation on the Maltese labour market

34 A dedicated think tank will be set up to develop policy actions related to the impact of technology and automation on the Maltese workforce. The think tank will:

- Conduct research to identify the more vulnerable skills and jobs in society
- Propose and publish actionable insights to help the Government, businesses, unions and employer associations to develop robust transition plans
- Engage in dialogue and perform consistent monitoring to develop in-depth insights into how these jobs are likely to be impacted
- Establish defined training paths to help workers build new skills which better match the needs of businesses
- Assess whether employment reforms and safeguards may need to be introduced to offset potential major upheavals in the job market which may be caused by automation
- Develop incentive proposals to drive employers' investment in upskilling
- All key stakeholders, including trade unions and employer associations, will be asked to participate in the think tank. The project will be coordinated by the National Skills Council and the eSkills Malta Foundation, which includes various representatives from government, industry and education. The two bodies are currently working on projects to evaluate skills and policy measures to address current and future skills gaps and upskill industries sectors in digital and emerging technologies, and the think tank will align with these activities.

Equip the workforce with stronger digital competencies and new skills

- 35** The Government will also design and launch a national reskilling programme to help vulnerable workers to develop new digital skills through the provision of short training courses and support measures for on-the-job training. The programme will consider ways to involve the refugee community in such initiatives.
- 36** Further support measures will be developed to help employers to invest more in on-the-job training and employees to undertake external training programmes.
- 37** The Investing in Skills programme, co-financed through the European Social Fund (ESF), will be operational until 30 June 2023 and has a budget of €5m to help employed people develop and increase knowledge and skills through training.
- 38** The eSkills Malta Foundation, in collaboration with MDIA, will seek to offer professional certification courses in AI to various target groups.

Build awareness amongst the general population of what AI is and why it is important

- 39** Although AI is expected to bring numerous opportunities and improvements to our quality of life, it is acknowledged that this could be a big change. Another fundamental view is that this change cannot be avoided; instead, it is something that needs to be embraced and leveraged within our society and institutions.

²³ Source: Communication from the Commission (2018). Artificial Intelligence For Europe (COM(2018) 237 final). European Commission.

- The Malta.AI Taskforce also conducted a survey²⁴ amongst a representative cross-section of the Maltese population to measure awareness and attitudes towards AI. The research highlighted that:
 - More than 60% of respondents did not have the correct understanding of what AI is
 - Only 42% were aware that they had ever interacted with an AI device. However, when made aware of some common AI applications, 80% indicated that they had used one of these services over the last year
 - Survey respondents' comfort with AI usage varies by area of application, with just over 80% being comfortable with AI in transportation, and only about half being comfortable with AI in financial advice and justice
 - 70% expect AI to be beneficial to society, while 8 out of 10 respondents would be open to using more AI if it helped them in their daily lives

40 The Government will launch a national campaign to build awareness of what AI is, counteract fears and showcase how it will benefit Maltese citizens of all ages. The campaign will highlight how no parts of Maltese society will be unduly burdened or left behind as AI adoption accelerates. A key part of the campaign will aim to build trust in AI usage amongst the older generations who stand to benefit hugely from AI-enabled assistive home technologies, which can offer support with self-care and help offset anxiety, confusion and loneliness.

Build awareness of AI amongst students and parents

- 41** The MEDE, with the support of other stakeholders, will continue to organise the annual AI Family Challenge, a hands-on AI education programme that brings together families, schools, communities and technology mentors to give everyone the chance to learn, play and create using AI. They will also organise AI-themed weekends, game-jams and AI hands-on workshops for children of all ages.
- 42** The MEDE will also support and give funding to an annual AI Olympiad. The event is targeted at students in primary and secondary years and challenges them to learn and use AI methods to solve real-world problems. The winning team will be awarded the prize of attending and participating at the Global AI Congress event overseas.

Foster and embrace the adoption of AI in education

- One of the Malta AI Strategy's key goals is to develop a modernised and boosted education system for Malta. While the education system and curricula have undergone a number of developments and innovations in recent years, the broader delivery of training and education has not developed significantly from the traditional classroom-based setup.
- Advancements in AI in education have the potential to allow for a personalised learning system which draws on vast learner and student data, leading to a richer and better transfer of knowledge.
- The MEDE has a wide-reaching vision of how AI can support its priorities and continuous improvement. This includes the introduction and implementation of AI to help administrators and educators to provide individual and adaptive learning experiences, as well as predicting analytical trends to take informed decisions and develop relevant policies to achieve the targets set out in Malta's education strategy.
- These changes will not happen overnight or in isolation from other activities: they will be introduced gradually over the coming 10 years in close collaboration with educators, teaching unions, parents, students and other related stakeholders.
- As part of the development of the National AI Strategy, the Malta.AI Taskforce Work Group for Education and Workforce met with a number of policy makers, educators and industry representatives to understand their position, levels of support and concerns relating to the introduction of AI in education. A workshop was held in conjunction with the largest teachers' union in Malta, the Malta Union of Teachers (MUT), where their representatives put forward over 30 different ideas of how AI solutions could be incorporated into the education environment from student, teacher and system-facing perspectives.
- The MEDE will now take forward a number of pilot projects to support the introduction of AI in education. Further information on the proposed pilot projects is provided on page p.30.
- 43** The MEDE will also set up a working group involving schools and all of Malta's teachers' unions with the remit to co-develop the implementation of these projects, jointly assess outcomes and develop a strategy for a wider roll-out of AI in education.

²⁴ Note: The survey was conducted between June and July 2019 across a sample group of individuals that reflects the demographics of the Maltese population.

Develop teachers' knowledge and awareness of AI in education

- The Strategy recognises and acknowledges that the functions of the human teacher cannot be replicated or automated, and that AI in education represents support for the teaching profession in the continuous development of people. Tools should assist teachers, not create additional burdens.
- Building support for the introduction of AI tools in education requires teachers to develop appropriate awareness, be kept informed on key developments, receive appropriate training and ensure that any implementation plans are properly structured.

44 The MEDE will organise an annual conference on AI in education to inform, support and disseminate good practices in AI for teaching, learning and assessment purposes. International experts from the teaching profession will participate and share key learnings relating to the use of AI in their educational establishments.

45 The MEDE will develop and introduce introductory AI training at all levels, including education officers, school management, teachers and learning support assistants.

46 The Government will also introduce a scheme to provide financial reimbursement for educators wishing to obtain certification in approved Massive Open Online Courses in AI-related fields.

47 The UoM will look to introduce AI-related components as part of an update to its Masters in Teaching and Learning programme, which qualifies graduates to enter the teaching profession in Malta.

Equip all students enrolled in higher education programmes in Malta with AI skills

- AI is expected to change or transform work activities across every economic sector. It is therefore imperative to build AI knowledge and skills across all academic disciplines as the younger generation get ready to enter the working world.

48 Starting in the 2019/20 academic year, students undertaking any course at the UoM will be able to select AI elective modules as part of their studies. The modules will provide students with European Credit Transfer and Accumulation System credits (ECTS), which count towards their overall degree.

49 The Malta College of Arts, Science & Technology (MCAST), Malta's technical college for applied studies, has committed to introducing obligatory AI components across all courses within the next three years.

50 The MEDE will also work to support private higher education institutions in developing and expanding current and future AI-related programmes and modules.

Increase the number of graduates and post-graduates with AI-related degrees

- AI skills are in high demand and are crucial to a thriving AI ecosystem. LinkedIn recently published research on the most promising jobs of 2019²⁵: "These positions come with high salaries, a significant number of job openings and year-over-year growth, and are more likely to lead to a promotion." Data scientists topped the list of promising jobs in the US, whilst machine learning engineers had the joint-highest median US salary.

• The UoM's AI department has its roots in the early 90s when the first AI research was being conducted. Today, it offers various short courses, a B.Sc.AI, an M.Sc.AI and a PhD degree which provides specialisations in different areas of AI.

• Undergraduate student intake for the B.Sc.AI course increased by 300% across the 2018/19 academic year and is expected to increase once again during the 2019/20 academic year.

51 The UoM will look to develop an Applied AI Platform (an interdisciplinary entity within the university aimed at fostering collaborations between different faculties and institutions) over the coming years. The investment will enable the UoM to increase the number of academics, areas of research and specialist modules it can offer; develop new joint degree undergraduate and post-graduate courses with other faculties; embark on new research and EU projects; increase its work with industry on AI-related projects; and accelerate AI awareness programmes.

52 The country will strengthen its core knowledge base of specialists by providing around 50 scholarships per year between 2020 and 2022, for students to undertake post-graduate studies in AI (Masters/PhD level) at the UoM. These scholarships will supplement those already provided directly by the university. The Government will also continue to provide scholarships and financial support to carry out post-graduate studies in AI outside Malta under the Tertiary Education Scholarship Scheme (TESS).

53 The Government recently introduced legislation to provide individuals who undertake Master (MQF Level 7) and PhD/ Doctoral (MQF Level 8) level qualifications with a tax credit for the full amount of income tax that would be due on the first €60,000 of earnings, subject to the satisfaction of certain criteria. The tax credit would be for a single year for individuals who obtain a Master's degree, and for a period of two years for individuals who obtain a PhD/Doctoral qualification.

²⁵ Source: Pattabiraman, K. (2019). LinkedIn's Most Promising Jobs of 2019. [online] Available at: <https://blog.linkedin.com/2019/january/10/linkedin-s-most-promising-jobs-of-2019> [Accessed 20 Jun 19].

54 To further increase the number of qualified AI specialists, the UoM will provide access to the Masters in AI programme to a wide cohort of applicants from different backgrounds. ICT professionals with strong industry experience but no undergraduate degree, and graduates with undergraduate degrees in different areas may be granted access to the course on either a full- or part-time basis, subject to completing three foundational modules prior to entry. This entry route is in place for the 2019/20 academic year and will remain thereafter.

55 MCAST will pilot the introduction of AI-specific components as part of post-graduate programmes in 2020 and will launch AI-specific post-graduate programmes by 2025. AI is already a key part of its IT-related programmes below post-graduate level.

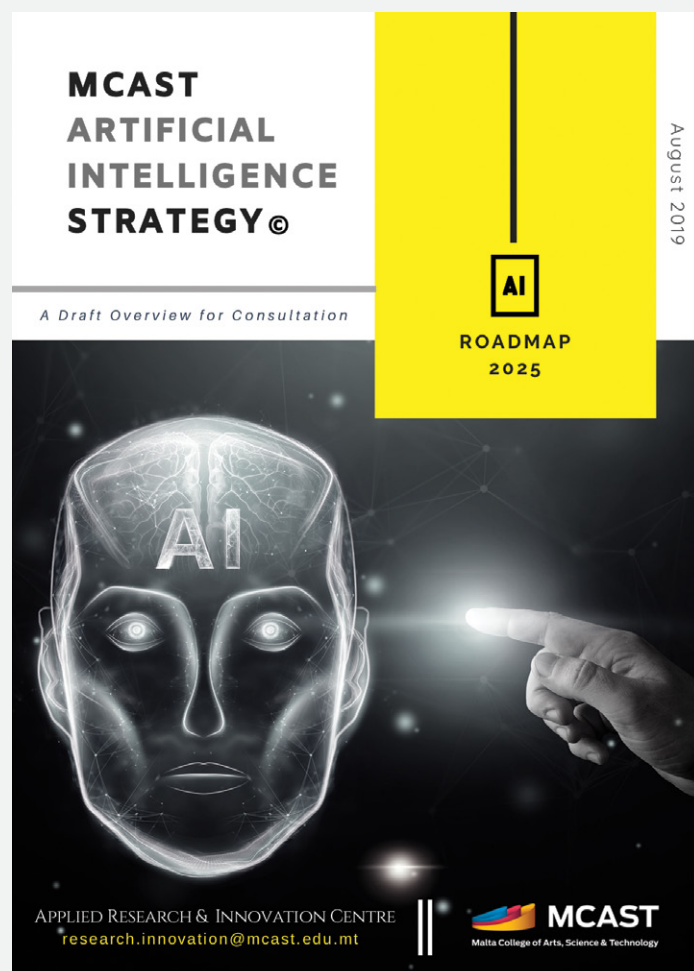
MCAST's AI Strategy and Action Plan

It is envisaged that, in the coming years, the AI revolution will bring about a series of disruptions in both the job market and the education ecosystem. MCAST has therefore developed the 2020-2025 AI Strategy and Action Plan, which aims to map out how:

- AI will be intrinsically embedded into MCAST's daily operations
- Students can be better prepared for an AI-powered industry
- AI tools will be used to improve learning experiences, support teachers and facilitate administrative functions
- Lecturers can gain more competence in understanding and applying AI in teaching, research and industry solutions

The MCAST AI Strategy and Action Plan will be enabled through nine strategic actions that will be undertaken over a five-year period. The initiatives include AI-enabled enhanced e-learning environments and intelligent tutoring systems, the development of AI-driven personalised learning applications, the introduction of AI as a core part of course curricula across all areas of study and the development of AI-specific courses, and professional development for academics in AI-related areas.

The MCAST AI Strategy and Action Plan is available for download at <https://www.mcast.edu.mt/wp-content/uploads/AI-Strategy-Final.pdf>



CHAPTER 7

LEGAL AND ETHICAL



Legal and ethical

AI raises profound questions across ethical, legal and regulatory domains, from protecting national security and citizens' rights to advancing commercial interests and international standing. As AI use cases proliferate, it is important that these issues are addressed at the outset to mitigate risks and unintended outcomes. Otherwise, Malta's development into the "Ultimate AI Launchpad" may be hindered by a lack of trust and low adoption by stakeholders.

For an AI system to be trusted, ethics, governance and strong control practices must be central to its design and deployment. Organisations which effectively incorporate ethical considerations into their AI projects, supported by a robust risk management system and monitoring mechanisms, can expect to gain a competitive advantage over their peers.

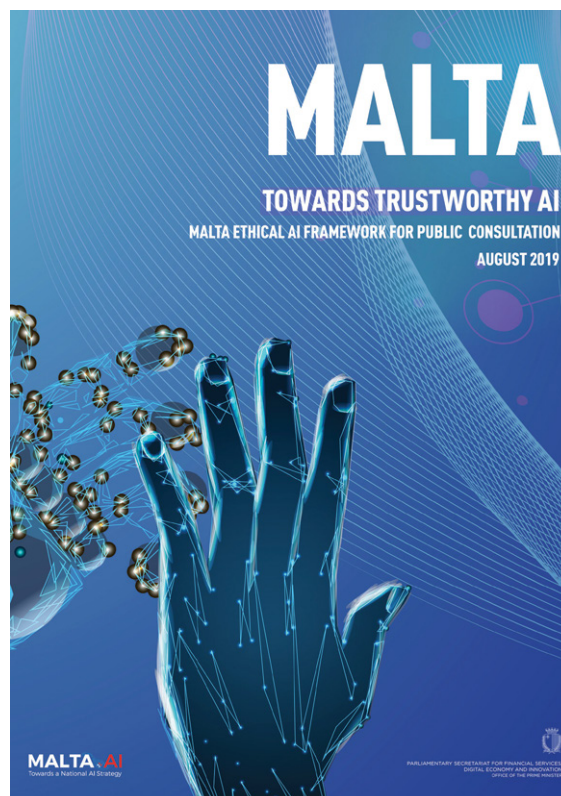
In order for Malta to develop a top 10 national AI programme, it will require an AI ecosystem that promotes acceleration in the achievement of the benefits of AI while minimising its risks.

Establish an Ethical AI Framework Towards Trustworthy AI

56 In August 2019, Malta published a draft Ethical AI Framework, *Towards Trustworthy AI*²⁶, which aims to establish a set of guiding principles and trustworthy AI governance and control practices. The Government's ambition is to create a practical and workable framework that can serve as a guide and enabler for AI practitioners to create trustworthy AI in Malta and beyond.

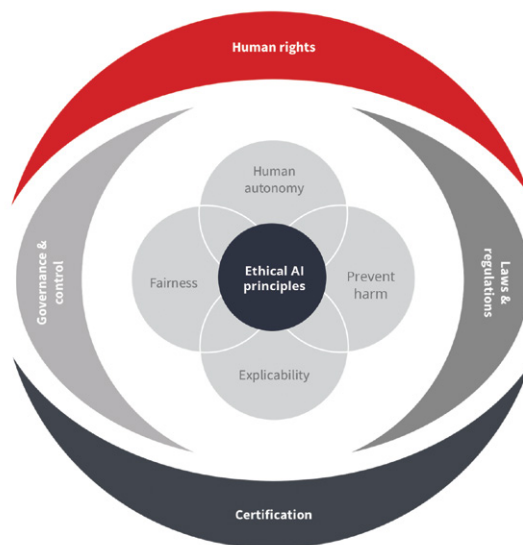
- The intention is for the Malta Ethical AI Framework to support AI practitioners in identifying and managing the potential risks of AI, while also serving to identify opportunities to encode a higher ethical standard into AI. The draft document was released for public consultation in August 2019 and the final version is expected in October 2019, shortly after the release of the Strategy.

57 A National Technology Ethics Committee will also be set up under the MDIA to oversee the Ethical AI Framework and its intersection across various policy initiatives, including investments in tools and continuous monitoring mechanisms, skills and capabilities, innovation ecosystem and regulatory mechanisms.



²⁶ Malta: Parliamentary Secretariat for Financial Services, Digital Economy and Innovation within the Office of the Prime Minister (2019). Malta towards Trustworthy AI, Malta Ethical Framework.

- Malta's Ethical AI Framework builds on the European Commission's AI HLEG *Ethics Guidelines for Trustworthy AI* published on 8 April 2019 and the *Recommendation of the Council on Artificial Intelligence* adopted on 21 May 2019 by the OECD countries and various non-member adherents.
- The Malta Ethical AI Framework sets out four Ethical AI Principles for establishing trustworthy AI which are in alignment with the European Commission's AI HLEG *Ethics Guidelines for Trustworthy AI*:
- Human autonomy:** humans interacting with AI systems must be able to keep full and effective self-determination over themselves
- Prevent harm:** AI systems must not cause harm at any stage of their lifecycle to humans, the natural environment or other living beings
- Fairness:** the development, deployment, use and operation of AI systems must be fair
- Explicability:** end users and other members of the public should be able to understand and challenge the operation of AI systems as required for the particular use case.



Malta Ethical AI Framework

A Communication from the European Commission titled *Building Trust in Human Centric Artificial Intelligence*²⁷ outlines that “trust is a prerequisite to ensure a human-centric approach to AI: AI is not an end in itself, but a tool that has to serve people with the ultimate aim of increasing human well-being”.

- To achieve trustworthy AI, the Ethical AI Principles discussed above must be translated into specific requirements for AI systems that can be measured and evaluated. Reflecting on the EU's work, the Malta Ethical AI Framework identifies seven specific requirements that AI systems should respect to be considered trustworthy.
- The Trustworthy AI Requirements are interrelated and should be continuously evaluated and addressed throughout the AI system's lifecycle. The relevance and level of importance of each of the requirements will depend on the nature of each use case, and will need to take into consideration the objectives, data sets, functional components, level of autonomy, environmental conditions and impacts of each particular AI system. It is also important to note that some of the above requirements are already reflected in existing laws. For example, Article 22 of the General Data Protection Regulation (GDPR) establishes that when companies use AI to make a “significant decision” about individuals, the data subject has the right to have a human review that decision.



Trustworthy AI Requirements

²⁷ Source: Communication from the Commission (2019). *Building Trust in Human Centric Artificial Intelligence* (COM(2019) 168 final). European Commission.

- It is common for early technology developers to prioritise innovation and benefit realisation over controls. But with AI, as it develops its decision framework through adaptive learning rather than pre-programmed code, it's important that ethical, legal and regulatory requirements are considered as part of the training conditions for an AI system from the outset.
- Due to the unique nature of AI and the quasi-cognitive nature of the activities it is performing, new control constructs will also be required to augment those historically used for legacy technology. The development of a robust system of controls for an AI system will require the retrofit of control practices over human-based processes to machine based-decisions, and the codification of ethical and trust objectives into system objectives and monitoring practices.
- The Malta Ethical AI Framework, *Towards Trustworthy AI*, also includes a set of over 60 illustrative leading practice control practices for AI, first at the governance level and then for each of the Trustworthy AI Requirements, which have guidance to AI practitioners in developing a robust control framework for ethical and trustworthy AI. The Malta Ethical AI Framework will be updated as new guidance materials are released and as changes are identified through AI project pilots.
- The draft Ethical AI Framework, *Towards Trustworthy AI*, is available for download at www.malta.ai. The final version will be released in October 2019 following an analysis of the feedback received during the public consultation.

Launch the world's first national AI certification framework

- Malta has taken a global lead in developing a regulatory and certification framework for innovative technology arrangements through the setting up of the MDIA and the creation of the Innovative Technologies Arrangements and Services (ITAS) Act. The certification framework was intentionally developed to be technology neutral and voluntary because the country understood that individuals and organisations of good intent would seek out a positive sign of recognition that would build trust and transparency amongst users, consumers and wider stakeholders, even if not mandated by a national competent authority (NCA).
- 58 • Malta intends to continue its strong tradition as an innovator and first mover in the space of innovative technologies. It will therefore amend the ITAS Act to expand the list of technologies that the MDIA provides certification for and become the first country in the world to launch a national AI certification programme in October 2019.
- The certification process will largely be based on Malta's Ethical AI Framework, which aligns and builds on the EU and OECD ethical frameworks, in order to provide applicants with valuable recognition in the marketplace that their AI systems have been developed in an ethically aligned, transparent and socially responsible manner. The ambition is to create the right frameworks to help trustworthy AI springboard from Malta to the world, in line with Malta's vision to become the "Ultimate AI Launchpad".
- Certification will be issued by the MDIA, the national regulator with responsibility for governmental policies and regulation on emerging technologies, including the development and enforcement of standards for compliance with local and international obligations.
- The MDIA's AI certification process will include a detailed assessment process carried out by independent, MDIA-approved system auditors who will review the control frameworks in place in order to achieve ethical and trustworthy AI. The process also includes a business review, with due diligence on the key people behind and involved in the business, to build additional layers of trust from users of the technology.
- The MDIA recognises that it is working at the forefront of technology regulation and the innovative technologies that it reviews. The main challenge is to ensure that the MDIA's regulatory function does not hinder innovation in the field of AI. The MDIA would like to actively collaborate with European institutions and international organisations on AI-related initiatives to understand emerging standards and norms, and firmly supports global initiatives to develop standards to use AI for good.
- Additional information about the Malta AI certification process is available at www.mdia.gov.mt and www.malta.ai.

Appoint a Technology Regulation Advisory Committee to advise on legal matters

- The regulation of AI is a hotly debated area. There are polarising views on the topic, with some commentators suggesting that AI regulation will stifle innovation and others firmly believing that it is the only way to ensure that AI technologies are used in an ethical and trustworthy manner.
- The EU Parliament stated that²⁸ “many policy aspects relevant for AI-enabled services, including rules on consumer protection and policy on ethics and liability, are covered by the existing regulatory framework on services”. It also said that it “considers that a comprehensive law or regulation on AI should be approached with caution as sectoral regulation may provide policies that are general enough but also refined up to the level where they are meaningful for the industrial sector”.
- The *Ethics Guidelines for Trustworthy AI* published by AI HLEG state: “AI systems do not operate in a lawless world. A number of legally binding rules at European, national and international level already apply or are relevant to the development, deployment and use of AI systems today. Legal sources include, but are not limited to: EU primary law (the Treaties of the European Union and its Charter of Fundamental Rights), EU secondary law (such as the General Data Protection Regulation, the Product Liability Directive, the Regulation on the Free Flow of Non-Personal Data, anti-discrimination directives, consumer law, and Safety and Health at Work Directives), the UN Human Rights treaties and the Council of Europe conventions (such as the European Convention on Human Rights), and numerous EU Member State laws. Besides horizontally applicable rules, various domain-specific rules exist that apply to particular AI applications (such as the Medical Device Regulation in the healthcare sector).”
- The European Commission has also set up working groups to consider whether updates or the development of new legislation might be required to fully address the risks and challenges brought about by AI technologies.

59 The Maltese Government will appoint legal experts to form a Technology Regulation Advisory Committee to:

- Assess and determine the extent to which existing laws and regulations will apply to AI technologies (matters relating to IP and liability-related issues will be a priority)
- Analyse local laws and regulations that may need to change to keep pace with technology
- Monitor and consider developments at a European level
- Advise on the setting up of a Regulatory Sandbox for AI

- Malta is currently working on a Private Law Bill that aims to provide clarity on specific provisions related to IP and liability issues in the context of DLT.
- As a next phase, the country will explore whether further provisions could be developed which would clarify ownership of IP rights in AI-generated outputs, particularly where multiple entities are involved in the value chain. Liability-related issues on specific use cases, open source development and automated decision making will also be explored to help determine if supplementary legislation may be needed to mitigate some potential blockers and grey areas in existing legislation. Furthermore, the country will look into competition law and the antitrust aspects of AI with respect to control of data.

Set up a Regulatory Sandbox for AI and a Data Sandbox for AI

- Certain regulatory provisions may restrict the ability to test new AI applications and ideas.

60 The country will therefore look to set up a Regulatory Sandbox for AI which will provide regulatory exemptions to enable firms to explore and test concepts and solutions with proportionate safeguards, in a contained environment for a well-defined duration. Sandbox tests are expected to be modelled on particular use cases. The Technology Regulation Advisory Committee will therefore work with the MDIA to identify and determine the best legal and operational structure for the Regulatory Sandbox, given the diverse range of applications, sectors and regulations that AI can potentially touch.

- The European legislative framework on the protection of personal data (the GDPR) sets out clear and strict rules on how the processing of personal data must be carried out by controllers to ensure that the fundamental rights and freedoms of data subjects are safeguarded.

61 In addition to the Regulatory Sandbox proposed above, the Office of the Information and Data Protection Commissioner (IDPC), as the national data protection authority, will also set up a Data Sandbox to support organisations that need to use personal data in the process of developing or testing innovative products and services in the specific area of AI. Data Sandbox participants will be guided and assisted by the IDPC on how to apply data protection rules and requirements to their projects and be given assurances, to the extent possible, that such projects do not infringe the provisions of the GDPR. The scope of the Data Sandbox is to give a certain level of comfort from enforcement action. Projects will be assessed on the degree of demonstrable benefit that they will potentially deliver to the public.

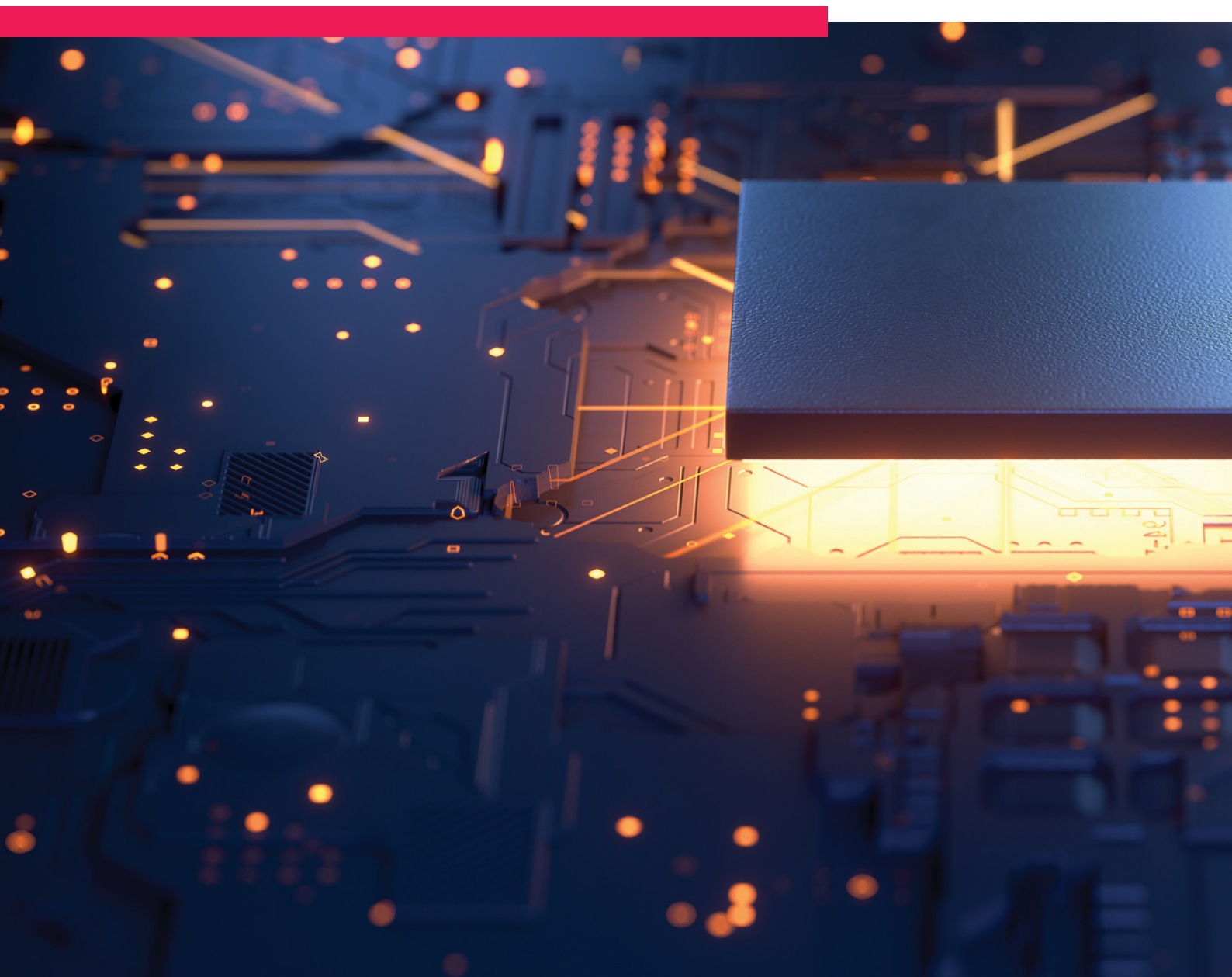
- Both of these services would be closely monitored to enable the regulatory authorities to contain risk, and build capacity and experience in regulating these fields.

²⁸ Source: Motion for a European Parliament Resolution on a comprehensive European industrial policy on artificial intelligence and robotics ((2018/2088(INI)). European Parliament.



CHAPTER 8

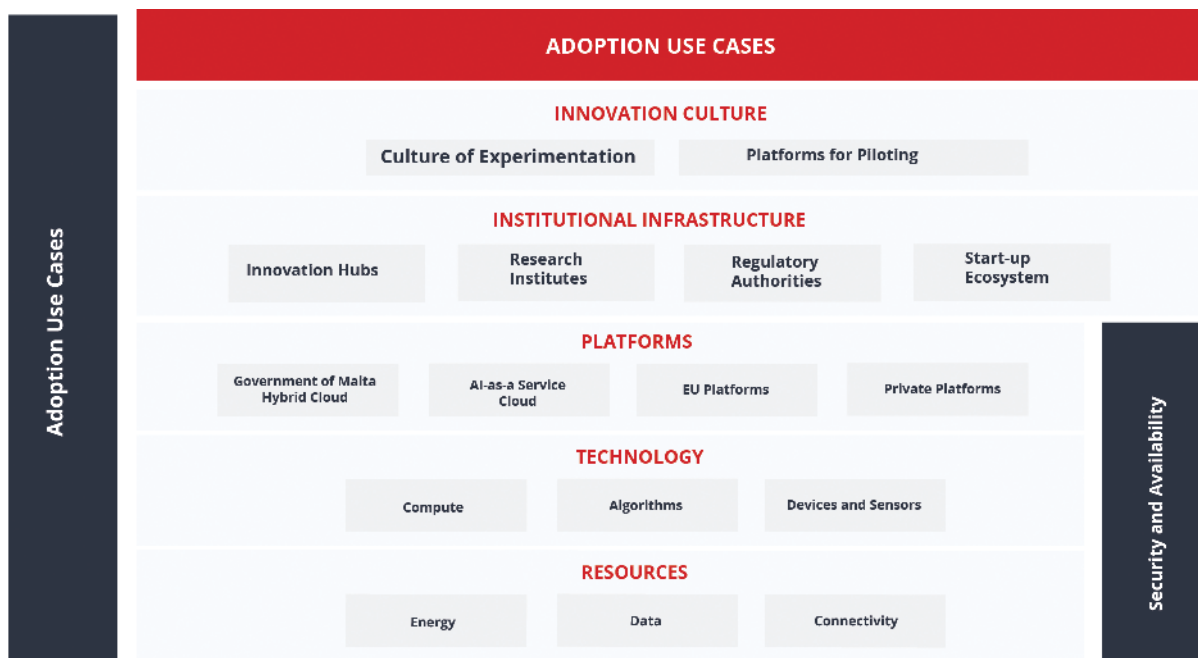
ECOSYSTEM INFRASTRUCTURE



Ecosystem Infrastructure

The Government is aware that cutting-edge technology and data infrastructure, together with supportive regulatory and policy initiatives, are needed for the Malta AI Strategy to truly take off.

There are various dimensions of enabling infrastructure that need to be part of a holistic AI ecosystem, which are illustrated in the diagram below.



Investment in Maltese Language Resources

- In 2013, Rosner and Joachimssen assessed the state of the Maltese language in digital media, particularly the extent to which it is used and, more importantly, the extent to which such use is supported through the deployment of tools and resources. The conclusions reached from the results of this analysis are that the level of technological support for Maltese, compared with that for other European languages, is extremely low, giving rise to the threat of “digital extinction” for the language. In this context, “digital extinction” refers to the possibility that Maltese, while possibly maintaining its status as a national tongue with institutional support and recognition, is nevertheless virtually absent from digital media.
- English has therefore become the default language choice across most technological devices in Malta, simply because there are more resources available and they are easier to use.

62 In order to counteract this, the country will make crucial investments in the development of Maltese language resources and tools. The investment will enable computers to be able to process, understand and generate Maltese text and speech, and AI solutions to be developed and accessible in both of Malta’s national languages and become a part of everyday life.

- The Maltese language resources and tools will also have a ripple effect on many sectors, including education and health. It will be possible to create more advanced software to process data in Maltese in a more efficient and accurate manner and to create education tools for the Maltese language that make use of these underlying language technologies.

Incentivise further investment in data centres

- AI applications are likely to generate and require a tremendous amount of near real-time data, necessitating adequate data centre infrastructure on the island to support the high-quality connectivity and high-efficiency hosting services.
- Therefore, the sustained growth of the data centre services market in Malta, and the positive sentiment towards further market development opportunities, have given rise to continued investment in the industry. Additionally, to meet the growing computing and storage demands of public services, both the Government and the UoM have invested in building their own data centre facilities.

63 The Government is keen to stimulate further private investment into the sector. Malta Enterprise, the country’s economic development agency, will offer a number of support measures and incentives to encourage this, while competitive electricity tariffs are on offer to companies undertaking such business activities.

Establish a Digital Innovation Hub (DIH) with a focus on AI

- Institutional infrastructure will be required to drive AI adoption, and these organisations will be mandated to provide support to the intended end users. The European Commission's Digital Europe Programme²⁹ includes proposals for €9.7b in funding for supercomputing, AI, cybersecurity and trust, digital skills and DIHs ("one-stop shops" for SMEs and public administrations to access technological expertise, advise and experimentation facilities) which are being established as centres of excellence that provide insight into industry practices and research.

64 Malta plans to establish a DIH with a focus on AI. The hub will be a multi-stakeholder innovation centre that aims to help both the public and private sector to grasp new digital opportunities. The DIH will allow both public and private stakeholders to access sector-specific, technological and financial expertise, and streamline efforts to increase Malta's AI-related research and innovation activities. The DIH aims to provide assistance in setting out how the application of AI can be used to solve real-life problems through applied research, demo spaces and advisory services.

Increase the extent of the open data availability to support AI use cases

- As part of the implementation of the Public-Sector Information Directive, the Malta Information Technology Agency (MITA) drafted its *National Data Strategy*³⁰ in 2016 with a holistic and comprehensive vision for the management of data across the whole public administration, set out as one of the pillars of the Digital Malta Strategy, and a vision for data to empower citizen and business applications. The *National Data Strategy* comprises a set of general principles and best practices that should guide future investments in this domain.

65 Additionally, MITA has recently launched Malta Data Portal³¹, which included 41 registers and 200 data sets covering 10 sectors by September 2018, and will increase as the initiative is further developed. It aims to provide a one-stop shop for the discovery, viewing, downloading and online usage of data which is classified and has all the requirements of the open data definition. As a next step, The National AI Strategy will consider measures to increase the number of public data sets available, while ensuring that the interests of Maltese companies and individuals are protected.

66 As part of the National AI Strategy, a roadmap will also be prepared to identify ways of integrating information from sensor-based sources and other relevant data into

national open data processes and platforms. The work will include an assessment of readiness of the current open data registry towards nurturing the development of applications powered by AI.

- INSPIRE, formally known as European Directive 2007/2/EC, establishes an infrastructure for spatial information in the EU. The Directive was transposed into Maltese legislation under the provisions of the Development Planning Act and brought into force by Legal Notice on 22 December 2009. Environmental-related geospatial data sets are available through the Malta Spatial Data Infrastructure (MSDI) portal. AI use cases will also require access to geo-spatial information, and the MSDI is an enabler to this.

Provide cost-effective access to compute capacity

- Access to large-scale compute capability is a foundational element of AI research and development. Malta will require access to local, regional and global infrastructure and will consider various policy measures to facilitate this. Emerging compute capabilities and technologies could potentially be explored to create a mix of specialised compute solutions, each targeted at different use cases, thereby improving the overall cost effectiveness. Many organisations throughout Europe have already invested heavily in the creation of significant compute capabilities.
- On a national level, supercomputing cluster A.L.B.E.R.T. at the UoM supports various research initiatives, including studies that are catered towards AI. Moreover, the Government of Malta Hybrid Cloud offers flexible architecture and access to a global, scalable infrastructure that can utilise cloud machine learning tools.
- The European High-Performance Computing Joint Undertaking (EuroHPC JU) will pool European resources to develop top-of-the-range exascale supercomputers for processing big data, based on competitive European technology. The EuroHPC JU is a legal and funding entity which will enable the pooling of EU and national resources in high-performance computing (HPC), with the aim of:

- Developing a pan-European supercomputing infrastructure: buying and deploying two supercomputers in the EU that will be among the top five in the world and at least two others that would today rank in the global top 25 for Europe's private and public users, and scientific and industrial users, for use in more than 800 scientific and industrial application fields
- Supporting research and innovation activities: developing a European supercomputing ecosystem, stimulating a technology supply industry, and making supercomputing resources in many application areas available to a large number of public and private users, including SMEs³²

²⁹ Source: European Commission (2018). *EU budget: Commission proposes €9.2 billion investment in first ever digital programme*. [online] Available at: https://europa.eu/rapid/press-release_IP-18-4043_en.htm [Accessed 11 Mar. 2019].

³⁰ Source: MITA (2016). *National Data Strategy*.

³¹ Source: Malta Data Portal website. [online] Available at: <https://open.data.gov.mt> [Accessed 5 Aug. 2019].

³² Source: European Commission. *The European High-Performance Computing Joint Undertaking – EuroHPC*. [online] Available at: <https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking> [Accessed 5 Aug. 2019].

- The total planned budget for EuroHPC JU from 2019 to 2026 through the co-investment with Member States is around €1 billion, €486 million of which emanates from the actions already planned by the European Commission in Horizon 2020 and Connecting Europe Facility (CEF) programmes in the current Multiannual Financial Framework (MFF).³³ The budget will be matched by a corresponding amount from participating countries, where industry has expressed an existing need for HPC access for research purposes.
 - Through the EU's share in the EuroHPC JU, the Maltese Government can benefit from the EuroHPC initiative through the involvement of national stakeholders in the relevant European funded research. In the longer term, if industry demand for access to the EuroHPC research facilities justifies it, government can explore joining the EuroHPC funding to provide such access.
- 67** The Maltese Government will look towards expanding access to high-performance compute capacity across on-demand, on-premise and European infrastructures as part of the National AI Strategy.
- 68** A feasibility study will be conducted to assess the needs for HPC in Malta, taking into account interoperability, participation and dependencies with regard to EuroHPC.
- 69** AI is exceedingly being offered through cloud platforms. The Government will therefore leverage the investment in the Government of Malta Hybrid Cloud to support demand for AI compute capacity and make use cases of a limited scale more feasible to undertake.
- 70** The Government will also pilot a small-scale supercomputer cluster hosted locally to support public sector, private sector and research use cases for potential interconnection with EuroHPC. Investment could facilitate migration of demand from the Government of Malta Hybrid Cloud to a national super compute cluster in 2022 if economics for cloud are less favourable to a capital outlay in national HPC infrastructure.

Expand Malta's data economy through 5G and IoT

- Malta has a leading telecommunications infrastructure and is at the top of the European Commission's Digital Economy and Society Index (DESI) 2019 scoreboard for coverage of next-generation access (NGA) technologies and ultrafast broadband connectivity³⁴. Fixed broadband speeds of up to 1Gbps are available on a nationwide basis, in addition to connectivity from 75,000 high-speed Wi-Fi hotspots.
- Malta is connected to the global internet by five submarine fibre optic cables to Sicily (which is connected to mainland Italy), all delivering high-capacity international connectivity. The Maltese Government is also actively studying the

feasibility of a new submarine cable connecting Malta to other locations, with the goal of enhancing the resilience and quality of the current international electronic communications connectivity.

- All three local telecommunication companies have expressed their intention to continue investing in upgrading their mobile networks, while planning to capitalise on new technologies such as 5G and the IoT.
- The Maltese telecoms regulator already operates a test-and-trial licensing scheme in support of innovative spectrum uses; it aims to exploit Malta's unique potential as a test bed, both for technology tests and service trials involving third parties or the public.
- An international telecommunications company recently signed a memorandum of understanding (MoU) with the Government to promote and harness the latest disruptive technologies to boost innovation in Malta. Two pilot projects are currently underway, with the first using the IoT for a network of public smart recycling bins and the second focused on smart parking applications. The company announced that it will also be collaborating with the Malta on AI-related areas.
- The Maltese Government will actively engage with local and international companies that are interested in using the country as a test bed for 5G and IoT trials, as it is believed that investment in these complementary technologies will boost the development of Malta's AI ecosystem and stimulate the launch of new data economy services, products and applications across different economic sectors.
- An EU-financed Research on Smart Cities project is currently underway. The project aims to assess the latest advances in Europe in the development of smart cities and determine which are most applicable to Malta, along with how much they would cost to implement and sustain. The experiences that have been learnt through the adoption of these developments by other European Member States are also being analysed to proactively determine the potential outcomes of local smart city developments.

- 71** The Government is keen to ensure that investments undertaken in sensor and device infrastructure which can enable IoT applications are fully leveraged. It therefore plans to:

- Develop a registry which provides information on all government sensor and IoT networks
- Identify where DLTs can add enhancements, including decentralised authentication services and digital trust at scale
- Develop and prototype applied DLTs within a sensor and IoT network, assess results and propose a strategy for wider roll-out

³³ Source: EuroHPC Joint Undertaking. *Leading the way in the European Supercomputing*. [online] Available at: <https://eurohpc-ju.europa.eu/> [Accessed 5 Aug. 2019].

³⁴ Source: Digital Economy and Society Index Report. (2019). European Commission

Identify best practices for securing national AI solutions

- Launching cybersecurity on a national scale essentially calls for a planned, collective and systematic approach. Accordingly, this led to the need for a National Cyber Security Strategy which brings together all the relevant players in the cybersecurity space. In line with European regulations, Malta maintains an established Critical Information Infrastructure Protection Directorate, which also operates the national Computer Security Incident Response Team.
 - The Directorate also serves as the national authority overseeing Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security for network and information systems across the EU. The oversight of the security of electronic communications networks and services is part of the regulatory remit of the Malta Communications Authority, whereas privacy and data protection aspects are overseen by the Information and Data Protection Commissioner. MITA oversees the cybersecurity of the Government's infrastructure and establishes government policies in the cybersecurity space. Other relevant players include the entities entrusted with public security, such as the police and the army.
 - A National Cyber Security Strategy was launched in September 2016 following public consultation. The document presented the strategic approach for cybersecurity on a national scale. It intended to build an awareness of cybersecurity, its extent and its implications for Malta as an integral part of cyberspace.
- 72** The intersection of AI and cybersecurity poses various technical, ethical and governance challenges. The Government will therefore undertake a risk assessment of national AI solutions and look to establish the security requirements, both physical and cyber, to safeguard national and public security from inherent threats, hazards and vulnerabilities.



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