Εθνική Στρατηγική ΤΝ:

Δράσεις για την Αξιοποίηση και Ανάπτυξη της ΤΝ στην Κύπρο

Τμήμα Ηλεκτρονικών Επικοινωνιών
Υπουργείο Μεταφορών Επικοινωνιών και Έργων

REPUBLIC OF CYPRUS
MINISTRY
TRANSPORTATION, COMMUNICATIONS AND WORKS

PART
ELECTRONIC COMMUNICATIONS
NICOSIA 2048

Project Title	: **National Artificial Intelligence (AI) Strategy: Actions for the Utilization and Development of AI in Cyprus**
Service	: **Department of Electronic Communications, Ministry of Transport, Communications and Works**
Version	: **1.6**
Date	: **13/01/2020**

Writing

The **Department of Electronic Communications (DEC)** of the Ministry of Transport, Communications and Works, in collaboration with a team of Artificial Intelligence (AI) experts, have proceeded with the writing of this document, the first draft of the "National AI Strategy: Actions for the Utilization and Development of AI in Cyprus".
This was preceded by the preparation of the draft "National AI Strategy", which was based on the EU coordinated TN1 plan, other AI strategies from EU Member States and the proposals received from an AI Expert Group through a questionnaire prepared by THE. This was followed by the establishment of working groups, and after meetings, exchange of views and proposals, the 1st version of the draft "National AI Strategy" was created. THE, in its effort to include the views of all stakeholders in the AI plan, promoted the questionnaire to organizations in the digital ecosystem, the public sector, businesses (SMEs, start-ups) and banking organizations in Cyprus. The working groups continued their work taking into account new information and material, which emerged from the rest of the academic community and the involvement of other bodies, resulting in the creation of this plan.

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[1] https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence

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1 Introduction

1.1 The Role of Artificial Intelligence

Artificial Intelligence (AI), as defined by the International Telecommunication Union2, is expected to significantly impact our daily lives, where machines and computers will be able to perform repetitive tasks with great accuracy. In addition, they will have the ability to learn, improve and make informed decisions in ways that will allow them to perform tasks that were previously considered possible only through human experience, creativity and ingenuity. The possibilities of AI are limitless and are expected to help, among others, the medical industry, such as improving diagnoses and developing innovative treatments for incurable diseases. It can also enhance the reduction of energy consumption through the optimal use of natural resources, reduce the need for pesticides, contributing to a cleaner environment, improve weather forecasting, prevent disasters, identify cybersecurity problems early and generally improve the living conditions of modern people in an environment of circular and sustainable development. AI can automate processes and operations in companies and industries with the main consequence of a sharp reduction in operating costs. AI will become the main driving force of economic growth and productivity growth, contributing to the sustainability and viability of the industrial base in Europe. The contribution of AI is expected to transform the modern world, as happened with the steam engine and electricity in the past.

1.2 Summary

This document, draft **"National AI Strategy: Actions for the Utilization and Development of AI in Cyprus",** includes five (5) basic sections:

1. Introduction
2. Maximizing investments through partnerships **(Pillar** 1)
3. Creation of national data spaces **(Pillar** 2)
4. Cultivation of talents, skills and lifelong learning **(Pillar** 3)
5. Developing ethical and trustworthy TN **(Pillar** 4)

The "National AI Strategy" plan proposes actions for the Utilization and Development of AI in Cyprus, and is based on **Action 1.4: Kick-off Action** (Section 1), and the **four (4) key pillars** (Sections 2 - 5) of the European Commission (EU) coordinated plan, "Artificial Intelligence with a European stamp3".

[2] https://www.itu.int/en/ITU-T/AI/Pages/default.aspx

[3] https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence

Action 1.4: Kick-off Action – This action has an important role in the updating, implementation and execution of the “National AI Strategy” plan, since it ensures the collaboration of THE with a group of AI experts, which, under the coordination of THE, will be responsible for the implementation of the plan's actions, reporting and informing the competent Minister (Deputy Minister). The Expert Group, under the coordination of the THE, will determine objectives, timetables, key performance indicators, the involved bodies and the financial-administrative resources required, while also submitting suggestions regarding communication policy. In addition, it is proposed to establish the creation of individual working groups, with representatives of businesses, research institutions and other stakeholders on AI issues.

Under each strategic pillar, the main challenges we are called upon to address are presented, as well as the actions promoted by the state, as they emerged from the results of the consultation we had with the stakeholders. In order to address the main challenges and the structural weaknesses that arise in each strategic pillar of implementation, **Actions have been defined,** which are listed in the last subsection of each strategic pillar.

National AI Strategy: Cyprus' Objectives

Due to the financial constraints that characterize the availability of resources regarding technology and AI issues in Cyprus, investments must be targeted in order to make optimal use of public funding. To this end, the following specific objectives are set:

- Creation of programs to promote and develop AI technology in all organizations (academic, public, general government, local governments, private and businesses)
- Enrichment and interoperability of available data Cyprus
- Upgrading the education system
- Expanding the skills of AI experts and the human resources of organizations and businesses
- Developing an ethical and trustworthy AI
- Building international cooperation through Cyprus' participation in initiatives and programs of the EU and other countries

With the implementation of the above objectives, Cyprus will become an economically competitive state, oriented towards research and innovation, now acting as an equal partner in AI issues in the European and international environment.

1.3 Compliance with the European Union Coordinated Plan

The European Commission (EU), in a communication sent on 07/12/18, presented the coordinated plan4 developed jointly with the Member States (MS) to promote the development and use of AI in Europe.

The plan proposes joint actions for closer and more effective cooperation between the MS, Norway, Switzerland and the Commission, in four key areas:

- Increased investments
- Making more data available for use by AI
- Promoting advanced digital skills
- Ensuring trust

Strengthening coordination between MS in the coordinated plan is considered essential to essential in order for Europe to become the world's leading region for the development and use of innovative, ethical and safe AI, taking into account international competition from either the USA or Russia, or from the largest/ emerging economies in Asia such as China, South Korea, India and Japan.

The Coordinated Plan provides for the following:

1. Maximizing investments through partnerships

The plan foresees increased coordination of EU investments in AI, with the aim of creating greater synergies and mobilising at least €20 billion of public and private investment in AI-specific research and innovation from 2019 to the end of 2020 and over €20 billion through public and private investment over the next decade. Complementing national investments, the Commission will invest €1.5 billion by 2020, 70% more than in 2014-2017. For the next long-term EU budget (2021-2027), the EU has proposed to invest at least €7 billion in AI from Horizon Europe5 and Digital Europe6 . Joint actions to achieve these investment targets include:

- **National AI strategies:** by mid-2019, the Commission encourages MS to have drawn up their own strategies outlining investment levels and implementation measures, which will feed into discussions at EU level.

[4] https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence

[5] https://ec.europa.eu/programmes/horizon2020/en

6https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027

- **New European public-private partnership on AI:** there will be a new research and innovation partnership on AI, to strengthen cooperation between universities and businesses in Europe and to define a common strategic research agenda on AI.

- **New fund for AI deployment:** the Commission will support AI and blockchain startups and innovators in their early stages, as well as companies in their expansion phase.

- **Developing and connecting world-leading AI hubs:** European AI centres of excellence will be developed and connected, world-class testing facilities will be created in areas such as connected mobility, and the use of AI will be encouraged across the economy through digital innovation hubs. A European Innovation Council pilot initiative will also be launched to support the next generation of AI technologies.

2. Creation of European data spaces

The future development of AI requires access to large volumes of secure and comprehensive data. In cooperation with European countries, the Commission will create common European data spaces for seamless cross-border data exchange, while ensuring full compliance with the General Data Protection Regulation (GDPR7). By mid-2019, the Commission will set up a data exchange helpdesk, which will provide practical advice to all European participants in the Data Economy.

3. Cultivation of talents, skills and lifelong learning

The talent available in Europe is essential for the development and use of AI. However, EU countries face shortages of professionals in the field of Information and Communication Technologies (ICT) and lack specialised higher education programmes in AI. This is why the Commission, together with European countries, will support advanced degrees in AI, through dedicated scholarships. The Commission will also continue to support digital skills and lifelong learning for the whole of society, and in particular for workers most affected by AI, as detailed in its AI strategy8.

. In terms of human-centric AI development, it is also important to include AI in educational programs in other sectors and disciplines, such as law. The full use of the “Blue Card” system (entry and residence of highly qualified workers) will also contribute to

7https://ec.europa.eu/info/law/law-topic/data-protection/reform/rules-business-and-organisations/principles-gdpr_en

[8] https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence

retaining and attracting highly qualified AI professionals in Europe.

4. Developing ethical and trustworthy AI

AI raises new ethical issues, for example potentially biased decision-making. In order to build trust, which is essential for societies to accept and use AI, the Coordinated Plan aims to develop technology that respects fundamental rights and ethical rules. A European group of experts, representing academia, business and civil society, is working on ethical guidelines for the development and use of AI. The first version was published at the end of 2018 and the experts presented the revised version9 to the Commission in April 2019 after a broad consultation through the European Alliance for AI. The ambition is then to promote Europe's ethical approach globally. The Commission seeks cooperation with all third countries that wish to share the same values.

The Coordinated Plan on **"Artificial Intelligence with a European Brand"** outlines actions starting in 2020 and paves the way for activities in the coming years. Coordination with MS will continue and **the plan will be reviewed and updated annually.** The Commission's new AI knowledge service, **"AI Watch",** will help monitor the development of AI in Europe and implement the coordinated plan. For this plan to be successful, **the Digital Single Market and its regulatory framework need to be completed.** MS and the European Parliament need to agree as soon as possible on legislative proposals on cybersecurity, open data and the next EU budget, which includes funding for research and innovation, as well as the development of AI technologies.

[9] https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines/1

1.4 Inaugural Action for the Update and Implementation of the "National AI Strategy" Plan

AI Expert Group

In order for the state to play the role of a guide in the implementation of AI and digitalization, it must ensure the cooperation of a group of leading experts in the field of AI and digitalization, which will represent all the stakeholders involved. Under the coordination of the Department of Electronic Communications (DEC), the implementation of the "National AI Strategy" and the actions described in this document will be promoted, accounting for and informing the competent Minister (Deputy Minister). The Expert Group will recommend the implementation of actions for the implementation of a policy for the adoption of AI facilitators and the digitalization of e-government. This work will also aim to ensure the adoption of new models of cooperation between the public and private sectors, so that the necessary decisions can be taken and measures can begin to be implemented in accordance with the pace of development of AI.

The AI Expert Group will also be responsible for submitting proposals for updating the plan and objectives at regular intervals to adapt to new data. Before the first revision of the plan, a SWOT analysis should be taken into account, which will identify the strengths and weaknesses of Cyprus, as well as the opportunities and threats that exist. Important tools for this purpose are the Competitiveness Report10 of the “Cyprus Economic and Competitiveness Council”, the EU report “Country Report – Cyprus 201911” and the “New Industrial Policy of Cyprus 2019-203012”. To achieve the above, the AI Expert Group, under the guidance and coordination of the THE, must take into account and participate in activities related to the "Digital Strategy of Cyprus", which is characterized as an "umbrella" strategy for many other individual strategies. Also important is participation in initiatives organized by other entities, such as the conference organized by the House of Representatives "4th Industrial Revolution: Innovation, AI and Integration". It is noted that the group should be composed of individuals who will have time reserved for meetings, supervision and will be able to provide guidelines throughout the execution of the actions of the plan, but also afterwards.

Starting its work, the AI Expert Group must determine the following:

10 http://www.ecompet.cy/ecompet/ecompet.nsf/all/9183D5F9CA3F61B0C225843C001E3808/$file/Cyprus%20Competitiveness%20Report.pdf?openelement

11 https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-cyprus_en.pdf

12 http://www.mcit.gov.cy/mcit/sit/sit.nsf/All/220B7D9555067150C225819C002A15CC?OpenDocument

- Strategy execution schedule - Mapping of all stakeholders involved (Categoryization, interests, contribution)
- Specific, measurable and achievable goals on AI issues in Cyprus (e.g. training 1000 people each year in AI techniques, creation/support of 20 new businesses based on AI)
- Key performance indicators and milestones
- Financial and managerial resources for the implementation of the AI Strategy

- Communication strategy

Communities of Practice

Creation of local Working Groups with researchers, experts and other stakeholders on AI issues. The aim is to network stakeholders and collaborate to form opinions and knowledge that can be transformed into recommendations to the AI Expert Group, with the aim of updating the National AI Strategy and evaluating its measures. The working groups will operate in a structured manner with the aim of studying issues that will be determined by the THE following recommendations from the AI Expert Group. In order to implement the above and to attract new interested members, it is proposed to create an electronic hub that will facilitate the work of the working groups. In this way, actions related to AI and being developed nationwide can be recorded and highlighted.

Representatives of Businesses and Research Institutions

In order to develop a common strategic agenda for research and innovation in the field of AI, the AI Expert Group, the Foundation Research and Innovation (RI13) and the THE should establish a working group, representing stakeholders from industry and research institutions at the level of managing directors. This will allow for the development of an agenda and commitment to the implementation of this programme at the highest possible level, thus paving the way for a new partnership in the field of AI.

Active participation in the European Commission working groups

The European Commission presented the coordinated plan developed jointly with the MS to promote the development and use of AI in Europe. Working groups in the European Commission continue their work on ethical guidelines14 to achieve a trustworthy AI. The Department of Electronic Communications, representing Cyprus, and in consultation with the AI Expert Group, will continue to actively participate in the work of the European Commission, actively influencing the course in which the development and rules of AI and the digital economy should be directed. At the same time, it will be able to oversee the progress and actions of other MS in order to be able to implement best examples and practices.

[13] https://www.research.org.cy/el/home

[14] https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

2 Maximizing Investments through Partnerships

2.1 Business, Competitiveness

Outward-looking businesses with investments abroad have played the most important role in the development and implementation of AI and are those whose business models are based on digital platforms,
with a global level of action. In this way, they managed to gather a large volume of data and gain an advantage in the current development and application of AI.

Due to the global interest in the use of AI techniques, and in particular the use of Machine Learning techniques, international companies and research units have proceeded to develop reusable and freely available tools. As a result, even startups or small and medium-sized enterprises (SMEs) can, without significant investment in human resources, adopt technologically advanced AI solutions simply by applying the available tools to their own data and systems. Although some of these tools require significant computing resources, these can be purchased from cloud services and/or High Performance Computing (HPC) when and to the extent required, without requiring additional investment in technological infrastructure. Cyprus has several SME and start-up businesses that can benefit from the application of AI and expand their business activities using digital platform business models (Platform Economy). The state must also provide information about the opportunities offered by AI and its application methods, ensuring the availability of more data for experimentation and AI experts.

Competitiveness Report15

One of the main analytical tools that the THE is called upon to use and the AI Expert Group is the Competitiveness Report of the Cyprus Economic and Competitiveness Council. The preparation of the first Competitiveness Report was completed in the 1st half of 2019 and includes a general overview of the structure and performance of the Cypriot economy, highlighting the comparative advantages, weaknesses and risks facing the economy, including recommendations for addressing these risks and weaknesses. The report

evaluates the performance of the Cypriot economy both overall and in selected sectors, based on international benchmarking indicators (e.g.
WEF Global Competitiveness Report16, WB Doing Business Rankings17), comparing it with the corresponding performance of other (selected) economies, the EU average as well as the corresponding performance of previous years.

15 http://www.ecompet.cy/ecompet/ecompet.nsf/all/9183D5F9CA3F61B0C225843C001E3808/$file/Cyprus%20Competitiveness%20Report.pdf?openelement

16 https://www.weforum.org/reports/the-global-competitveness-report-2018

17 https://www.doingbusiness.org/en/rankings

For the purposes of monitoring the preparation of the first Competitiveness Report, a competent Steering Committee has been established with the participation of representatives of the Directorate-General for Economic and Social Affairs, the Ministry of Finance, the Cyprus Statistical Service, the Ministry of Labour, Welfare and Social Insurance, the University of Cyprus and the SRSS18 .

International cooperation To achieve healthy competitiveness and economic growth of businesses in Cyprus with the help of AI, coordinated actions will be required. International cooperation is essential in all activities, so that Cyprus becomes a profitable and attractive place for international organizations. This will require efforts both at the level of expertise and in the operational environment, participating in international networks and utilizing all the advantages of the country in an effort to gain a significant role in developments.

Exploitation of research and innovation by businesses
As far as businesses are concerned, it is important for Cyprus to develop high-level research and innovation by ensuring collaborations with leading international research organizations. The results of research must be easily exploitable by both the public and private sectors, which requires investment and cooperation between companies, research institutions and the public sector.

2.2 Public Sector

In the area of digital public services, Cyprus ranks 19th among EU countries. This position is below the EU average and has been declining since 2017 (DESI 201919). The Digital Strategy20 and the reform agenda21 include measures to promote e-government and e-health, strengthen the capacity of the public sector through the provision of more e-services, and facilitate cross-border cooperation. It should be noted that the transition to the AI era will require new types of cross-sectoral management and operating models, in which data and resources will no longer meet traditional boundaries between organizations. Traditionally, we have been used to using machines and software to optimize processes, under human supervision. In the future, AI will be able to perform tasks and tasks autonomously and at the same time collaborate with humans.

[18] https://ec.europa.eu/info/departments/structural-reform-support-service_en

[19] https://ec.europa.eu/digital-single-market/en/scoreboard/cyprus

20http://www.mcw.gov.cy/mcw/dec/digital_cyprus/ict.nsf/3700071379D1C658C2257A6F00376A80/$file/Digital%20Strategy%20for%20Cyprus-Executive%20summary.pdf

21https://ec.europa.eu/info/sites/info/files/2018-european-semester-national-reform-programme-cyprus-en.pdf

Digitalization and AI will redefine the performance of work in the public sector as well. Operating models in the new era will have to be created without any dependence on the organizations themselves. This means that data and resources will be used where they are needed. Activities based on traditional organizational models do not create the best conditions for a digitalized society using AI.

Improved services with AI

With the introduction of AI, authorities will be able to respond to people's needs digitally, regardless of time and location. Because AI can already perform many tasks in parallel, and in some cases better and faster than humans, the end result will be of higher quality. Supervision, reporting, processing applications and customer service are all examples of tasks where AI is already being used in Europe. In this way, AI improves the quality of services and speeds up administrative decision-making with the help of an automated decision-making chain. In addition, AI in public administration serves citizens and businesses in real time. The use of AI in public sector services will increase transparency, which will potentially also increase citizens' trust in the state and institutions.

The fundamental role of public administration in the era of AI will be to oversee the right of citizens to use their own data in various services while maintaining data protection. A citizen will be able to freely choose which data interests him, as a result of which services will become even better and more constructive. In addition, AI, together with other technologies, will facilitate the integration of public administration into people's everyday lives, ensuring their well-being at all stages of life. The adoption and use of AI and Data Science technologies in the design and implementation of e-Government (EG) projects is a prerequisite for the successful implementation of the strategy.

2.3 Research and Innovation

AI as a rapidly changing sector will require a fast-paced and flexible research and innovation system with adequate resources, leading us to constantly review our goals. Implementation should be business-led with the aim of attracting foreign corporate investment to Cyprus. International standard testing and experimentation environments will play a vital role, facilitating access to world-class infrastructure and data sources. The existing Cypriot corporate tax rate should be kept low and attractive for new investment and further financial incentives may be needed to attract companies involved in emerging technologies.

A major challenge for the implementation of TN is the need for research in many areas of science. Therefore, a key factor for the development of AI is the effective and targeted support of Research & Development. Research and Development in AI is implemented by public and private research institutions, universities and other involved bodies. The research covers a wide range of technological topics of AI.

AI R&D is also carried out by some companies, including SMEs. Large companies operating in the AI sector are predominantly international and their R&D results are used abroad. According to the Cyprus Competitiveness Report, only 6% of Cypriot companies collaborate with academia. This percentage is much lower than the EU average (13.3%). More targeted measures need to be taken with specific incentives for academia and businesses to develop quality and long-term collaborations. An important part of the AI research and innovation ecosystem are start-ups. Currently, a number of start-ups are active in Cyprus in the AI sector. These companies focus on the development of products and services, with a particular emphasis on the information and communication technologies sector. According to the Competitiveness Report, the percentage of start-ups in Cyprus is low, citing possible reasons and suggesting measures. A network of investors and venture capitalists needs to be developed in Cyprus, by searching for projects suitable for venture capital financing, and connecting them with the local research ecosystem of Cyprus.

In addition to the above, Cyprus' scientific base must be strengthened both by attracting leading researchers to support research and innovation, and by supporting existing talent with training and visits to and from leading organizations in the field of AI. These actions will ensure the competitiveness of the technology, address the challenges of innovation, and facilitate the transfer of research results to industry.

2.4 Standardization and AI

Standardization plays a supporting but also leading role in the development of AI, the products and services that frame this Technology. International Standards are essential for promoting industrial innovation and improving the quality of AI products and services. Through the use of Standards, the security of the industry ecosystem and by extension its users is significantly maximized. AI is already used in many sectors, with examples of applications in healthcare to adapt patient treatments, in the financial sector to detect fraud, in autonomous vehicles to determine the optimal speed and in robot workshops

in the construction industry. Standardization is expected to play a significant role in the adoption of AI in the market, contributing positively to the management of some of the pressing challenges related to machine decision-making. The International Standards Organizations ISO (International Standards Organization), IEC (International Electrotechnical Committee) and ITU (International Telecommunications Union) develop standards, i.e. technical specifications, which together with conformity assessment can support information systems and industry to address some of these challenges. Standards are needed to enable the development and adoption of AI. As a basis, it will be important to have a common terminology for use by all stakeholders, which will allow clear communication and sound decision-making. The collection of requirements and best practices can guide the implementation and development of the technology. Looking at the core of AI, Standardization of algorithms and computational techniques can enable a higher level of adoption, use, and interoperability of this technology.

2.4.1 International Technical Standardization Committees for AI issues

ISO/IEC Standardization Technical Committee JTC 1 SC 42

The International Technical Committee for Standardization ISO / IEC JTC 1 / SC 42, which was established by the International Electrotechnical Committee (IEC) and the International Organization for Standardization (ISO), is the competent Committee for standardization in the field of AI.

International Telecommunication Union (ITU) – Focus Group on Machine Learning for Future 5G Networks

The "Machine Learning for Future Networks 5G" Working Group develops International Standards, Technical Reports and Specifications for Machine Learning for future networks, including architectural network interfaces, protocols, algorithms and data formats.

European Telecommunications Standards Institute (ETSI) - Industry Specification Group (ISG) – Experiential Network Intelligence (ENI)

The European ISG ENI Working Group is responsible for developing standards in relation to the definition and architectural management of cognitive networking, using AI techniques and policies that respect the environment based on user needs and industry business objectives.

2.4.2 Standardization at National Level

It is important that experts and other stakeholders from Cyprus participate in the standardization work of the International Organizations ISO, ITU and ETSI. In this context, they can play an important role in the creation of International and European standards for AI technology.

contributing decisively to supporting the economic and industrial interests of Cyprus.

The **Cyprus Organization for Standardization (CYS) ,** following a relevant request, is planning the establishment of a National Reflection Committee with participating Technical experts from the public and private sectors so that:

(1) To monitor and evaluate the Standardization work of International and European Committees on Artificial Intelligence issues.

(2) Members of the Committee and other experts to actively participate in International and European Committees with the aim of promoting the National interests of Cyprus, while simultaneously expanding their knowledge and gaining experience in the application of Standards in the introduction of Artificial Intelligence in all sectors of the economy.

2.5 Actions for the Development of AI

2.5.1 Incentives to promote the use of AI solutions

Facilitation must be provided at all stages of companies' preparation for AI, with the ability to access and exchange data across AI-connected platforms and ecosystems. The requirements for AI implementation must be effectively adapted to facilitate companies that are in the early stages of digitalization and need specific support.

The pace of development of AI is very fast and its exploitation and development are based on tests and experiments. Therefore, it is of paramount importance that businesses have an efficient and fast way to join the development of AI. Businesses need government assistance and tools that will facilitate the development and acceleration of innovation activities.

Measures to facilitate the implementation of AI

- Preparation of a study with possible measures that will facilitate the experimental application of AI and allow us to remove unnecessary obstacles to accelerate its implementation.
- Creation of an information program on the preparation that businesses will need and the benefits they will gain from implementing AI.

- During the creation of measures, the sectors in which businesses operate, their size and their current ability to implement TN must be taken into account.
- Ability for businesses to access affordable analytics infrastructures such as Platform-as-a-Service (PaaS), Machine Learning as-a-Service (MLaaS) similar to those offered

from Microsoft Azure, Amazon Web Services, Google Cloud, as well as HPC infrastructures, similar to those offered by CaSToRC-CyI22 .

- Tax breaks and funding for businesses, public and private organizations for the use and testing of various AI solutions and data utilization. - The state, in collaboration with the OEB23 and CCCI24, should create a team of support consultants who will oversee and assist businesses with specific actions during the implementation of AI

- Information campaigns to prepare all citizens for the benefits and changes that will arise with the adoption of AI - Promoting the acquisition of both basic and advanced digital skills and training of business human resources in the application of AI.

- Providing incentives to employers through projects of the Cyprus Human Resources Development Authority (CHRDA25) for the training of their staff with an emphasis on programs that can lead to internationally recognized certifications. Utilization of subsidized e-learning programs.

- Promotion and use of educational programs according to the standards of other European countries and organizations (e.g. UK: https://www.gov.uk/guidance/introduction-to-artificial-intelligence-in-government, Finland: https://tem.fi/en/artificial-intelligence-programme, Others:https://www.elementsofai.com/,https://www.coursera.org/, https://deeplearning.ai, AI in a box by www.readyai.org)

2.5.2 Strengthening the competitiveness of businesses using TN

When creating measures to enhance competitiveness, the sectors in which businesses operate, their size and their current ability to implement AI must be taken into account. That is, categories of businesses should be formed (e.g. start-ups, SMEs, large) and the measures should be given competitively depending on the category to which the business belongs.

Furthermore, some businesses will need high-quality research to be able to effectively implement the technology, and some others simply need push and motivation.

New Management Models in Businesses
The opportunities offered by leveraging AI in business activities are not limited to the application of AI to business products and processes, but can help and strengthen overall business management. In practice, this

[22] https://www.cyi.ac.cy/index.php/castorc/about-the-center/castorc-center-overview.html
[23] http://www.oeb.org.cy/en/
[24] https://news.ccci.org.cy/
[25] http://www.anad.org.cy/

means that current management and administration models based on financial data must be replaced by new management models that use many and different data sources. The traditional organizational structure should change from a strictly defined hierarchy to a flat hierarchy with a decentralized tendency of responsibilities. The successful implementation of AI requires the continuous participation of stakeholders through the creation of teams. In large organizations this should be done gradually, starting with a small team in a pilot phase. A culture of expression and promotion of new ideas within the organization must be cultivated and mechanisms for searching and integrating new technologies must be created. Change management plans now play an important role in the development of businesses. Also, new roles such as “Chief Data Officer” or more specifically “Chief AI Officer” should be introduced in organizations. Finally, the human resources department should also

align with the needs of the organization and develop specific skills that can allow them to evaluate and hire personnel who specialize in this technology both at a technical and a more business level.

It must also be taken into account that there is a global trend towards the commoditization of all services. For example
Software-as-a-Service, Product-as-a-Service. Even specialized services (e.g. legal opinions) tend to these models. The goal is to offer services at a lower cost in order to reach a larger audience. The services are charged in relation to their consumption (pay-per-usage). The Cypriot industry must recognize the services that have the potential for such conversion so as not to absorb the

consumers of the corresponding service providers operating abroad.

Ecosystems that will help in the implementation of AI

The creation of smart and innovative ecosystems of international standard in the sectors in which Cyprus can make intensive and deeper use of AI (healthcare, transport, tourism, energy, security, etc.), as well as in promising emerging sectors
is a key pillar. It is important to support the development of AI centers, digital innovation hubs, incubators and AI accelerators as proposed in the new EU initiative "Digital Europe". These infrastructures will be the link between various actors developing and implementing AI technologies, such as research centers, businesses, the public sector and other involved organizations, and with this collaboration these ecosystems will actively contribute to the technological and practical development of AI.

The creation of an ecosystem must come from bottom-up actions and not top-down ones so that there is continuity and synergy within the ecosystem. To do this, funds must be provided for the creation of nodes of expertise. An ecosystem to be established

should be encouraged and supported by various policies while the functions of an ecosystem should be based on the business reforms that will be carried out due to AI. To facilitate the reforms, the possibility of developing and making available a national platform for providing applied tools (Toolbox), data and AI applications focused on various sectors of the economy and industry will be explored. With the guidance of specialist consultants, organizations (e.g. SMEs) will be able to use the platform, introducing and adopting

AI solutions that will upgrade their turnover.

The development of ecosystems and related innovation activities must promote cooperation with other states within the framework of partnerships and synergies with commonly accepted goals. It is clear that experiments and tests alone are not enough to create competitiveness and long-term investments will be required in the sectors we will choose. Success in this rapidly developing and revolutionary technology requires us to start from the areas in which Cyprus has experience and data sources. An important component for the smooth transition to the era of AI is the consideration of the needs of the market and businesses, during its implementation. Without the natural interest and strong investments of companies, the implementation of AI will fail with a serious risk of losing the results of research and innovation or we will be passive recipients implementing technological solutions and products that will be proposed by the market, especially by technological giants.

Ecosystem Forum

In the short term, the creation and strengthening of an ecosystem forum will be an immediate priority to accelerate the use of AI. This forum will also have access to all sectors affected by AI, provide support and distribute lessons and skills on the use and application of AI, as well as best practices.

The development and exploitation of AI depends on the available expertise and data sources, such as educational and business data. For this reason, implementation and exploitation are carried out through large economic platform actors or in ecosystems where the resources, expertise and benefits of different actors can be combined and distributed effectively.

2.5.3 Ensuring funding for research and innovation with continuous renewal of funds

Due to the fact that Cyprus' resources for the use and application of AI are limited and minimal compared to abroad, the need to increase resources is underlined, while ensuring that their utilization will be careful and targeted. In order to have access to

more resources for effective and successful implementation, bold investments must be made in pre-selected areas. Investments in AI
are subject to international competition, with a focus on the financing and operation of innovation spaces. Developed countries are investing heavily in AI know-how and research. In order for Cyprus to be able to attract new investments, it must develop, based on international standards, the research and innovation environment in order to secure the financing of these institutions. In order to ensure its competitiveness and financing, the Cypriot innovation system should support and combine applied research with research and innovation equally. Funding should be highly controlled and flexible, and emphasis should be placed on supporting international cooperation between ecosystems. Cyprus, as an EU member state, must ensure co-financing from EU research programmes in order to develop research and innovation. The participation of Cypriot institutions in various European programmes and projects such as AI4EU26 is important.

EOSC27 EuroHPC28 . An effort should also be made to use the EU Structural Funds for domestic and only AI research projects as well as appropriate infrastructure. The Hellenic Research Foundation will play a key role in securing research and innovation funds in the field of AI, with its advisory role on funding issues through the Horizon 202029 programming framework. Specifically, funding can be sought within the framework of

call for proposals "Artificial Intelligence and Technologies for Digitising European Industry and Economy" which falls under the "Information and Communication Technologies (ICT) Work Programme 2018-202030".

In order to ensure that the resources and capabilities of the Cypriot innovation environment can be brought up to European level, there must be intensive activities aimed at promoting research and innovation and disseminating it to businesses. Digitalization and in particular

The AI sector has highlighted the concept of applied research that requires testing and experiments that can be directly exploited by companies. In order to achieve the best possible result, the research and development activities of companies must be directly connected to the Cypriot academic research and innovation networks. At the same time, the Cypriot innovation system and its actors must be able to actively connect with leading international experts and hubs of expertise.

The state budget proposal concerning academic institutions must also take into account research, development and innovation projects that will be implemented in collaboration with businesses, to create

[26] https://www.ai4eu.eu/
[27] https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud
[28] https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking
[29] https://ec.europa.eu/programmes/horizon2020/en
30https://ec.europa.eu/programmes/horizon2020/en/h2020-section/information-and-communication-technologies

new products and services leveraging AI, robotics and other digital automation applications.

In the short term, innovation funding should specifically target the following issues:

- The application of AI in various sectors and its strengthening cooperation between the Public and Private sectors. - In business expertise
- In business-based ecosystems and strategic projects, with flexible funding models that will allow for the easy integration of new stakeholders through RIF AI programs.

- Strengthening the funding of institutions that offer high-level research that meets international standards
- New employment opportunities for young researchers with recognized qualifications in the field of AI. It is noted that there are several distinguished Cypriot scientists abroad in AI-related fields, who would like to return if employment opportunities arise.

- Support for the provision of consulting services to businesses by experts in the field of AI and for the creation of research/experimental development teams within businesses with the aim of the continuous development and implementation of specialized AI solutions.

In the long term, Cyprus should revamp its business subsidy system to support renewed business investment in skills and expertise. In addition, a pre-determined budget should be allocated to the RIF exclusively for the exploitation and development of AI.

2.5.4 Creation of a Center of Excellence for AI and Applied Research

The establishment of an international hub in Cyprus for AI issues should be a key objective of our strategy. The central hub should have adequate resources as well as effective cooperation processes with both national actors (companies and the public sector) and international stakeholders (research partners and customers). The cooperation of all actors is considered essential to achieve this goal. An educational center that will have the ability to offer certified specializations in both theoretical and applied aspects of AI can be established through synergies of the centers

excellence (RISE31, KOIOS32), public and private universities, as well as private sector initiatives. Such a hub can

[31] http://www.rise.org.cy/en-gb/

[32] https://www.kios.ucy.ac.cy/

help Cyprus evolve into an attractive destination for providing seminars and specializations for all sectors that use AI to optimize their processes, but also for leading experts who will help in the further development of the hub.

Creation of a Task Force of Researchers

Through the AI Center of Excellence, domestic funds (grants) such as ERC Advanced Grants33 and/or Marie Curie Co-fund34 and/or from upgrading the RIF programs such as the "Islands of Excellence" should be provided - RESTART 2016-202035, which will be accessible to all university institutions and businesses to attract researchers with a leading role in the field of AI. The aim of these funds is to create AI micro-nodes of excellence in each university, directly collaborating with the National Center of Excellence for AI (shared infrastructure and/ or sharing of researcher time). The essence will be for the researchers who will be invited through this fund to create a Task Force that will assist the THE and the AI Expert Group in creating policies to assist the use of AI in Cyprus.

Participation in the international research network

In order for Cyprus to establish itself as a country in the application of AI, the public and private sectors must have direct access to leading international know-how and results. Application alone is not enough and for this reason Cyprus must develop high-level research with participation in the international research network. Cyprus' research resources are limited and new resources must be sought and pooled.

In addition, we need to ensure that research results can be effectively exploited and implemented. Achieving this goal will require new, effective methods.

operation and continuous control of the quality of research. Joint participation, cooperation and contribution are required between the business and academic communities of Cyprus on issues concerning applied research, research projects and experimental infrastructures.

Government co-financing with the EU

Within the framework of the “Teaming for Excellence36” Action, which aims to create Centers of Excellence in Research and Innovation, our country managed to secure funding for a total of 5 proposals. The beginning was made in 2017 with the success of the centers of excellence KIOS and RISE, with total funding of €40 and €50 million respectively. In 2019, the success continued with the success of 3 new centers, EMME-CARE37, EXCELSIOR38 and MaRITeC-

[33] https://erc.europa.eu/funding/advanced-grants

[34] https://ec.europa.eu/research/mariecurieactions/actions/co-funding-programmes_en

[35] https://iris.research.org.cy/#/index

[36] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/teaming

[37] http://emme-care.cyi.ac.cy/

[38] https://www.excelsior2020.eu/the-project/

X 39, with a total funding of €30 million each. The Cypriot Government provides political and financial support to the Proposals through DG EPSA40
It is noted that the Proposals selected to proceed to the implementation phase will receive further funding from the European Commission of the order of €15 million each, and corresponding funding from the Republic of Cyprus. All of the mentioned centers, regardless of the area in which they specialize, are potentially either producers of innovation or users in AI issues. The government, with the funding to these centers, also looks forward to their participation in the implementation of this strategy.

2.5.5 Use of AI accelerator & Development of the startup ecosystem start-ups

Although the computing power and tools needed to implement AI are available, many companies lack the know-how and expertise to begin scaling up. Helping companies requires an approach that differs from a traditional research, development, and innovation program.

AI Accelerator Model
The AI accelerator model allows a group of companies to effectively test the capabilities of AI and to explore new solutions using it. The accelerator provides companies with access to experts and computing power, as well as access to the latest AI tools. Accelerators can be set up, for example, in research institutions that are networked and have sufficient resources to organize these activities. An effective and flexible funding mechanism should be created to support the construction of AI accelerators and the institutions that will implement them. In addition, an open development environment can be created to support various types of testing for digital economy platforms.

The operating model for the AI accelerator should include:

- Approximately 5+ businesses that will provide anonymized data and funding to an accelerator, which will enable research on the data.

- Two to three research centers and/or public and private universities to offer their expertise in research.
- An independent mediator will provide a testing environment as well as computing and storage resources.

[39] https://www.maritec-x.eu/en/

[40] http://www.dgepcd.gov.cy/dgepcd/dgepcd.nsf/index_en/index_en?OpenDocument

- Hackathon organizers will support the use of the accelerator testing environment in various competitions and other challenges.

- Introduction of smaller companies to develop and exploit the accelerator environment.
- Participation of consultants who, due to their experience in similar environments, will assist in the proper functioning of the accelerator.

Furthermore, it is necessary to create an open environment (with free data, open source software, tests, competitions) that will facilitate the development of the Cypriot AI experimentation and exploitation platform. The AI Expert Group in collaboration with all stakeholders must determine the timetable for the preparation and launch of the AI accelerator pilot program.

Using a Deep AI Accelerator

The AI Expert Group will explore the prospect of opening a comprehensive AI accelerator office in Cyprus, and based on the
results will make the appropriate recommendations to THE. There are companies abroad that have this specific program for AI, which we could exploit by bringing accelerator companies to Cyprus with the agreement that a number of places will be given exclusively to Cypriot start-ups. It is noted that there are also Cypriot companies that offer this type of service.

Development of the start-up ecosystem

In order to participate in the international digital economy, Cyprus must support, with a substantial and targeted investment, the development of the ecosystem of start-ups and small and medium-sized enterprises (SMEs) that are experimenting with revolutionary technologies. To support the development of AI tools and their adaptation to businesses, mutual cooperation between the public, business and research sectors is required, and the provision of the necessary number of experts and researchers for research and implementation of new AI technologies. The creation of government support programs that will target innovative technologies (AI, Big Data/data science, Cloud services, HPC, Cybersecurity) and their pilot applications is considered essential.

The state should also promote the trial introduction of pilot projects to the government by start-up companies in cooperation with research institutions. The creation and development of start-ups depends on investments and the use of venture capital to test and introduce new revolutionary products. By creating an investor platform that will provide incentives (e.g. absorption of partial investment risk by the state), investments in ideas and programs by start-ups will be promoted. The platform will provide the opportunity to meet those who innovate (innovators) with investors in order to secure financing.

It is also important to support incubators and accelerators for applications and services to help start-ups expand into foreign markets, and to connect emerging companies with large venture capital. In order to support the implementation of innovative applications in the market, it would be appropriate to establish grants as a tool to support young engineers and researchers who wish to transfer their research results to start-ups.

Incentives41 for creating start-ups:

- Creation of a financing program for start-ups to help increase revenue and implement their business plan
- Participation of the state as a shareholder through some mechanism (e.g. the European Commission's EIC42)
- Company creation with reduced registration costs
- Reduction of the amount of payments to government coffers for at least 1 time
- Offer of bookkeeping services by certified accountants with low cost
- Subsidizing part of the salary to up to 3 creators of such a company for the first year of operation
- Travel subsidy to professional exhibitions and start-up competitions for the first two years
- Agreements with cloud companies for reduced costs of purchasing cloud services and AI services

2.5.6 Upgrading Public Services & Creating new models of cooperation

AI will be able to become a service provider without the limits of time and location. In the future, citizens and companies will be able to seamlessly receive services at the given moment they need them without restrictions. To achieve this goal, the implementation of AI in public organizations is required, always taking into account data protection.

Public administration reform

The primary goal is to review and accelerate the digital transformation of public administration. Great emphasis must be placed on the functionality of the state with a focus on technology. New infrastructure

[41] The mentioned incentives for the creation of start-ups should be further processed, so that they are not considered illegal state aid in violation of the relevant European and national legislation, in particular Article 107 of the Treaty on the Functioning of the EU and the State Aid Control Law of 2001 - (30(I)/2001).

[42] https://ec.europa.eu/research/eic/index.cfm

(cloud servers, high bandwidth connectivity) and big data analysis tools (e.g. Hadoop) and collaboration with leading experts and consultants in new technologies are expected to be needed.

Changes in the way public works are managed

It is considered necessary to initiate an investigation and target setting that will determine the totality of the projects and needs of the public sector for the next 10 years so that the general picture of the needs of the public sector can be formed. After recording the needs, a
fragmentation of projects into as many smaller projects as possible. They must then be classified based on priorities, and their execution plan must take into account their dependencies so that there is a large percentage of projects that can be run in parallel. It is also necessary to find the required financial resources and modernize the
tendering and project execution procedures. By reviewing the relevant legislation on tenders, the possibility of participation can be given to SMEs and especially to start-ups which often do not meet the strict requirements of tenders. The modernization of the way of implementing projects can be made possible through the use and adoption of new “Project Management” methodologies and methodologies in the field of knowledge systems. “Agile[43]” methodologies propose a completely different way of implementing and managing projects compared to the traditional one, and are suitable for projects integrating new innovative technologies such as AI. The most well-known and accepted methodology in the field of knowledge systems is KADS [Wielinga, 1992] as well as its development, CommonKADS[44] [Schreiber, 1999].

Also very important is the promotion of test and pilot programs with applications from start-ups and SMEs in collaboration with research centers. The most promising pilot applications must first be identified and recorded. This should be followed by a public consultation to find the appropriate organizations, both public and private, that will deal with their implementation initially at a proof-of-concept stage, which will serve as a guide for their further development in the future into a Minimum Viable Product (MVP).

Prerequisite actions and projects

Under the guidance of the "AI Expert Group" and under the coordination of the THE, the state must determine the prerequisite actions and projects that must be implemented in the coming years in the Public sector, in order to be able to create AI services and applications.
in the context of the overall reform of the public sector. These actions should include the creation of infrastructure (cloud), the full digitalization of the operational processes of the public service,
employment of external consultants for the implementation of AI, as well as guidance

[43] https://en.wikipedia.org/wiki/Agile_software_development
[44] https://mitpress.mit.edu/books/knowledge-engineering-and-management

and cooperation from other countries abroad. The need to create procedures by which the public sector can purchase AI-related services is highlighted.

Guidance from the EU and abroad
Contacts and meetings with foreign countries that use successful AI applications in the public sector (e.g. Finland, Belgium) will help in collecting experiences and good examples that can be applied in Cyprus. The purpose of the meetings is to exchange ideas and organizational structure of the relevant bodies. Checking the possibility of exchanging know-how and adopting existing AI applications such as the Finnish application **"The citizen's Aurora assistant45".**

A new era of public-private collaboration In order to enable the widespread application and use of AI, collaboration and new forms of partnerships will be needed, particularly between the public and private sectors. Well-organized partnerships will allow us to eliminate unnecessary legislative obstacles to the development of AI and minimize the impact of major changes in the labor market.

If we want to overcome the difficult problems of our time, the division between the public and private sectors must cease to exist. The existing structure of public administration, the way in which power and resources are distributed will no longer be able to respond to modern changing problems. The new era must be examined and understood in a multidimensional way. This will only be possible by developing models of cooperation between different sectors. Cooperation is required between the private and public sectors, as well as with individuals. If public administration was previously seen as the only provider of public services, from now on it will act in collaboration with other actors in very broad ecosystems. For this collaboration to succeed, the digital transformation of the public sector must proceed rapidly, which must be based on a strong vision based on the opportunities and possibilities offered by digitalization and AI. More investment is needed in acquiring digital know-how and in data and service infrastructure. Adequate coordination and decision-making for measures based on studies and with great precision are needed.

By investing in expertise and in the development and implementation of new operating models, it will be possible to launch pilot projects and tests for the application of AI in the government sector. The public sector can play the role of a leader in the application of AI and digitalization with the guidance and collaboration of the AI expert group.

[45] https://vm.fi/en/AuroraAI-en

2.5.7 Digital Innovation Hub (DIH) AI

Creating a CPS AI

The establishment of an AI Innovation Hub in Cyprus will encourage the use of AI across the economy. Open platforms and industrial data repositories for AI will be available, in AI Hubs that will provide testing facilities and knowledge with specialized RIF programs in AI and its applications, to businesses and local innovation actors. With universities or research organizations at the center, businesses (e.g. SMEs, start-ups) can have access to technology trials, financing advice, market information and networking opportunities. The AI Expert Group will study the possibility of the AI Hub also operating as a virtual one (Virtual AI Innovation Hub), in which researchers from all over Cyprus can participate, as a platform for access to knowledge.

Digital Innovation Hubs in Cyprus

At the national level, Cyprus has CIEs46 such as the “Cyprus Digital Innovation Hub47” (CYRIC), the “KIOS Innovation Hub48” (KIOS Centre of Excellence) and the “CUT-RCDS-CC” (Cyprus University of Technology), the Entrepreneurship Center (University of Cyprus)49 which cover various market sectors (e.g. agriculture, health, construction, transport, manufacturing, food, basic and processed metal products, audiovisual equipment, machinery, electrical equipment, electricity and energy, retail, education, fisheries and mining) through a wide range of technological sectors which are presented indicatively as follows:

- Additive manufacturing (3D printing)
- **AI and cognitive systems**
- Augmented and virtual reality, visualization
- Broadband and other communications networks (e.g. 5G)
- Cloud computing
- Cyber physical systems (e.g. embedded systems)
- Cybersecurity (including biometrics)
- Data mining, big data, database management data
- ICT management, logistics and business systems
- Interaction technologies (e.g. human-machine interaction, gesture recognition and language technologies)
- Internet of Things - IoT (e.g. connected devices, sensors and actuator networks)

[46] https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool/-/dih/1459/view
[47] https://www.cyric.eu/cydi_hub
[48] http://www.kios.ucy.ac.cy/index.php/innovation/kios-innovation-hub.html
[49] https://www.c4e.org.cy/

- Internet services (e.g. website development, website production, design, networking and e-commerce)
- Location-based technologies (e.g. GPS, GIS, home location)

- Small and nanoelectronics, intelligent system integration
- Photonic, electronic and optical functional materials
- Robotics and autonomous systems
- Sensors, actuators, MEMS, NEMS, RF
- Simulation and modeling
- Software as a Service Architecture

The utilization and cooperation of these networks is particularly important for the implementation of any strategy and the future of applied AI in Cyprus. It is proposed to integrate these nodes into a single network and, where necessary, exchange personnel and know-how on AI issues.

Digital Innovation Hubs in the "Digital Europe50" program

Digital Innovation Hubs will play an important role in the Digital Europe programme to promote and adopt AI, HPC and Cybersecurity technologies across all organisations and the public sector in Europe and will have both a national and a European function. Member States are expected to jointly co-finance the national hub by funding the facilities and services at national level, while the European dimension (opening up the facilities across Europe and introducing missing expertise) will be financed through a Digital Europe grant. Member States should be involved in the selection process, as they will be responsible for defining the potential Digital Innovation Hubs. It is proposed to use the European Platform of National Initiatives for the Digitisation of Industry, until other mechanisms are established.

Participation in the AI4EU51 project

AI4EU brings together 79 leading research institutions, SMEs and large companies in 21 countries to develop shared AI resources, such as data repositories, computing power, tools and algorithms. It will offer services and provide support to potential users of the technology and help them test and integrate AI solutions into their processes, products and services. AI4EU, an open and collaborative platform, will also offer courses for upskilling and acquiring new skills. The AI4EU project team will work closely with the Digital Innovation Hubs for Robotics and the future network of AI Centres of Excellence to further facilitate access to AI technology.

50https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027

51 https://www.ai4eu.eu/

Participation in the project "AI Excellence in Europe"52

Following a €20 million investment to create AI4EU, the European Commission is taking the next step towards a long-term effort to unify the European AI community. This effort
is expressed in two actions:

1. Research and innovation Action to mobilize the best researchers in networks of centers of excellence that will reach critical mass on key AI topics.

2. Coordination and support actions to promote exchanges between the selected projects and other relevant initiatives.

These actions are expected to create synergies with the industrial sector and promote an ecosystem of resources, know-how and R&D infrastructure.

2.5.8 Coordination for digitalization

The responsibility for promoting digitalization has been distributed to a large number of public sector entities under the guidance and coordination of the Department of Electronic Communications (DEC), Ministry of Transport, Communications and Works. When planning public sector reforms, attention should also be paid to the interoperability of digital services across different levels of administration. This will require expertise and investment. New models of collaboration in the public sector must also be developed and adopted, so that the necessary decisions are made and measures are launched in line with the frequency of the AI era.

Cyprus Digital Strategy53

The Digital Strategy of Cyprus, as an "umbrella" strategy for many other individual strategies, which is based on the "Digital Agenda for Europe", the "Digital Single Market", as well as the broader "Europe 2020" strategy, was approved by the Council of Ministers Decision no. 73.162 and date 08/02/2012. Also, by the same Council of Ministers decision, the TCE and the above The Advisory Committee was appointed as the coordinating body for the implementation and realization of the Digital Strategy. Within this framework, the Board also decided to prepare and submit to it a relevant proposal to strengthen the staffing of the THE.

The vision of the Digital Strategy is: "Information and communication technologies to support the growth and competitiveness of the economy and the participation of citizens in social, cultural and political events."

52 https://ec.europa.eu/digital-single-market/en/news/ai-excellence-europe-eu50-million-bring-world-class-researchers-together

53 http://www.mcw.gov.cy/mcw/dec/digital_cyprus/ict.nsf/3700071379D1C658C2257A6F00376A80/$file/Digital%20Strategy%20for%20Cyprus-Executive%20summary.pdf

This Digital Strategy, with a horizon until 2020, has a holistic approach and includes the following objectives:

1. connecting all of Cyprus to high-speed networks, so that all citizens have access to high-quality and fast broadband infrastructure and services with security,

2. the digital modernization of the Government and the provision of effective and efficient public electronic services accessible to all,

3. empowering human resources through the education and training of all citizens, including vulnerable groups of the population, so that they can use Information and Communication Technologies (ICT) and digital media for work purposes and to carry out their daily transactions, 4. promoting the use of ICT by the private sector, so that businesses can increase their productivity by introducing innovative practices,

5. taking measures that will help green growth, where the use of digital technologies will help reduce greenhouse gas emissions.

For its implementation, three-year Action Plans have been prepared (2013-15, 2015-17, 2018-2020). The Action Plan 2018-2020 aims to develop a digital culture (informing about the benefits, building trust, developing capacities), encouraging active participation of citizens in digital activities, the broad digitalization of businesses, the provision of a wide range of broadband services (both from the public and private sectors), the provision of ultra-high-speed connections at affordable prices, and the development of modern broadband networks (FTTH, 5G).

Update of the Cyprus Digital Strategy

In order to update the Digital Strategy of Cyprus, the Department of Electronic Communications (DEC) has announced a tender. The subject of the tender is the preparation of the national digital strategy of Cyprus, which will aim at the digital transformation of the public sector, the promotion of the digital transformation of the private sector, and the promotion of innovation, taking due account of the digital maturity of Cyprus. The tender in question was awarded to the company PWC
and the relevant study is expected to be completed within 2020.

2.5.9 Smart Cities

More and more municipalities in Europe are starting to integrate technologies into city operating systems. Smart traffic lights that self-regulate according to traffic on the streets, lamps equipped with a series of sensors that record environmental data, smart cities without queues for services and buildings that save energy with the help of Artificial Intelligence. The “key” to the widespread application of “smart systems” in modern cities is the developments in the field of artificial intelligence. The first steps to creating a smart city are the installation of the “nervous” and “muscle” system

(IoT & Data). In order for the "Smart City" to bring qualitative results, it needs the mind, an autonomous center for processing the data produced, and making decisions, that is, AI machines. Applications based on "smart" systems and aimed at better managing existing natural resources and creating cities that are more friendly to people. For example, in Paris they connected a system to the trees in the city center and were able to see the air quality in real time and with algorithms to regulate the flow of cars in the center, improving the quality of life of people who walk, work or visit the city.

State-EU co-financing of Centers of Excellence for the implementation of projects related to "Smart Cities"

The government, through the co-financing of the centers of excellence of the H2020-TEAMING program, actively participates in the implementation of projects related to the sectors of smart cities and smart environments. The RISE center of excellence, coordinated by the Municipality of Nicosia, actively participates in the Municipality's plans in the field of smart cities, as well as in the creation of research and open to the public applications that will use the municipality's "Smart City" infrastructure. The KOIOS center of excellence is a pioneer in research activity in the fields of supervision, control and security of critical infrastructures, sectors inextricably linked to smart environments. The MaRITeC-X project aims to create innovative solutions in the shipping sector, based on the use of smart meters and infrastructure. Finally, both the EMME-CARE and EXCELSIOR projects create innovative solutions and study and measurement systems that can be used by "Smart City" applications to improve the quality of life.

3 Creation of National Data Spaces

Data is the fuel for the development and implementation of AI. In addition to the volume of available data, the quality and availability of data play an important role in achieving the benefits offered by AI. Cyprus must and can contribute to the creation of available data resources for use by businesses and the public sector. The most important step in this direction was taken with the creation of the “National Open Data Portal54”, which makes data from most Cypriot public bodies available for further use.

3.1 Actions for the Development of AI

3.1.1 Enrichment and Interoperability of Cyprus Data

Legislative framework for the use of data by all sectors
A clear legislative framework should be created to ensure the availability of data. It should primarily be based on the importance of the data for business activities, taking into account data protection. This legislation should take into account the EU Regulation (Free Flow of Data55) which ensures the effective removal of existing unjustified localisation restrictions and effectively prevents the introduction of new ones, thanks to the existence of a clear legal principle combined with review, notification and transparency, while enhancing legal certainty and confidence in the market. Also for Public Procurement software offers, the possibility of making data available via middleware that allows communication between applications (APIs) should be incorporated into the legislation

Interoperability of different data resources
The key requirement for digitalisation and the development of AI is the technical and semantic interoperability of data. If data is not circulated, cannot be digitally processed or its meaning is unclear, the adoption of AI cannot be achieved. For this reason, it is important in the new legislative framework to ensure that digital services can use the right and high-quality information at the right time, while taking into account the protection of personal data.

Data exchange agreements
Cyprus, due to its size, faces the issue of limited data availability for use by AI. The potential way to

[54] https://data.gov.cy/search?sort_by=changed&language=en
[55] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32018R1807

One way to overcome this challenge is to create data sharing agreements, such as trade agreements for goods and services.

Providing independent services through public data.
It is necessary to create an environment where the state will offer the possibility to create AI systems with test environments that will have access to anonymous public data. After evaluation and authorization, these systems can

systems to be integrated into all services offered by the state. Gradually, all state services should be obliged to make their data available for reuse by providing APIs from the EDPAD (Action 3.1.2). In order for AI applications to have real benefit, this is mandatory and indispensable. Where there is the possibility of making historical data available, these should be accessible so that they can be used by researchers to train AI systems. It is noted that a large part of the data in the Public Service is neither digitized nor anonymized. We must be particularly careful on the issue of data anonymization, because incorrect procedures may lead to the leakage of a significant volume of personal data with a multitude of negative consequences. In order for the above goal to be feasible, a limited, pilot use of already digitized and carefully anonymized data should be preceded, with parallel implementation of digitization and anonymization processes during data collection. Gradually, the availability of such data could be expanded by more public services.

Support for the creation of “Regulatory Sandboxes”
Companies should be encouraged to share data resources so that different types of testing can be carried out effectively. Clear provisions that can be extended internationally are needed to support this goal. A regulatory sandbox could be created for this purpose. It would be appropriate to consider establishing a regulatory sandbox, i.e. a trusted and protected environment under the supervision of a regulatory authority in which AI research and development can be conducted with trust in the use of data. Trust in the use of data is a legal model for data exchange, without legal restrictions, intended for training and developing new AI applications. However, this should be preceded by a thorough study of existing and future technological needs in combination with specific, identified shortcomings in the existing regulatory framework. Simply put, we first need to identify exactly where the problem lies and then test a possible solution in a controlled environment.

Implementation of European Commission recommendations such as "Prompting an EOSC in practice56" and "Turning FAIR into reality57 " The report **"Prompting an EOSC in Practice"** covers some key elements of the European Open Science Cloud (EOSC), from defining the ecosystem of minimum viable data for research, to defining the ground rules for participation. It also pays attention to issues such as governance and possible business models. The report analyses various aspects of how the EOSC can effectively connect people, data, services and training, publications, projects and organisations, presenting a set of detailed practical recommendations for implementation, engagement and management. It is noted that CaSToRC (Cyprus Institute) participates in the EOSC NI4S project together with the Cyprus Library for data management in Cyprus according to the FAIR principle.

The report "**Turning FAIR into reality** " describes the wide range of changes FAIR data principles. It presents research and analysis of what is needed to implement FAIR, providing
a set of specific recommendations and actions for stakeholders. Taking a holistic approach, FAIR data provides a template for fundamental changes in research practice and culture and the implementation and normalization of certain technologies and practices.

3.1.2 Strengthening the National Open Data Portal (EDPAD58)

EDPAD: Data available for everyone
The expansion of the collection and use of EDPAD data will become possible with new projects and legislative regulations. A large volume of data can be created during the life of an individual. Today, most data is collected through applications by public administration organizations and private service providers. In the near future, a lot of data will be created when a user enters their data through sensors connected to other users and environments (IoT). Abroad, successful businesses have managed

to collect large volumes of user data and secure their exclusive rights to use the data. The new society based on AI must guarantee the availability of data to those who really need it and their protection, as defined by Regulation (EU) No. 2016/679 (General Data Protection Regulation).

56 https://publications.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/5253a1af-ee10-11e8-b690-01aa75ed71a1

57 https://publications.europa.eu/en/publication-detail/-/publication/7769a148-f1f6-11e8-9982-01aa75ed71a1/language-one/pdf-format/source-80611283

58 https://data.gov.cy/search?sort_by=changed&language=en

The Administrators of the EDPAD and all stakeholders should initiate a study that will analyze the needs, methods and procedures that will be used to attract proposals (RFP) for the enrichment of the EDPAD data.

3.1.3 Creation of a National Research Data Portal

The application of AI algorithms often leads to the creation of large volumes of information and data sets. For the purposes of promoting and reusing these data by other researchers, it is important to proceed with the study for the design and implementation of the National Research Data Portal, within the framework of the operation of the National Research Data Portal, which will focus on the availability of data produced by research institutions in Cyprus.

4 Cultivating Talents, Skills and Lifelong Learning

Learning

AI will bring about significant changes on a societal level. The labor market will face revolutionary changes, as some of the traditional jobs will disappear and new ones will be created. Ensuring education and expertise will play a crucial role in helping society adapt to these changes. AI will change both society and the way we work. The education system will need to be adapted in such a way that it focuses on skills that machines will be less capable of, rather than those that will quickly become obsolete. Computer literacy in schools should be at a high level and students should be taught AI-related subjects such as Mathematics, Statistics and Programming. A skilled workforce is a key component of the development and use of AI. AI and digitalisation are rapidly transforming society and the economy as a whole, as well as the working environment.

Cyprus is experiencing a significant and persistent skills shortage in the Information and Communication Technologies (ICT) sector. ICT specialists in Cyprus (2.3% - DESI201959) continue to represent a lower share of the workforce compared to the EU as a whole (3.7% - DESI2019).
The demand for skills in emerging sectors, such as AI, is very high, as supply lags behind the market. Difficulties in attracting and retaining qualified human resources in Cyprus contribute to the skills shortage. Talented researchers and promising start-ups often receive attractive offers from abroad.

The strategy should cover the entire cycle of formal education, vocational training, higher education and post-doctoral level. At the same time, greater emphasis should be placed on lifelong learning to enable workers to acquire and improve AI-related skills.

4.1 Actions for the Development of AI

4.1.1 The labor market in the era of TN

AI will cause significant changes in the labor market. The structure of employment is expected to change in such a way that the proportion of middle-wage jobs will decrease. At the same time, the proportion of low- and high-wage occupations will increase. In part, this is due to technological developments that favor specialization and

[59] https://ec.europa.eu/digital-single-market/en/scoreboard/cyprus

skills, which leads in particular to an increase in demand for specialized professions. The jobs that are usually downgraded are characterized by daily and repetitive tasks, which computers can perform more efficiently (office work and assembly work in factories). However, AI

differs from previous technological developments in that it will also bring about greater structural changes in high-paying professions. For example, some of the processes followed by professions such as medicine and law can be automated with AI. On the other hand, the use of AI can increase the productivity of less educated individuals. Providing opportunities and training in AI to a wider group of workers could thus lead to a more equal society. Professions and job advertisements will undergo a transformation due to the adoption of AI. This change also includes jobs with particularly competitive salaries. By participating in labor market activities, we will see that the implementation of AI will not hinder productivity improvements with restrictions.

According to international studies, the 4th Industrial Revolution
is expected to affect the employment needs and skills of employees. Indicatively, the following are mentioned:

- **European skills and jobs survey (ESJS60)** by the European Centre for the Development of Vocational Training (Cedefop61): 14% of jobs, such as assemblers and operators of stationary machinery, in the EU are at high risk of automation. Related are the **Briefing Notes "People, Machines, Robots and Skills62"** and **"Artificial or Human Intelligence? 63",** which refer to how AI

  It affects jobs, especially those involving repetitive tasks, and what skills will be needed to complement AI-related technologies.

- **Research The Risk of Automation for Jobs in OECD Countries64** by the Organization for Economic Cooperation and Development (OECD65): The percentage of jobs at high risk is relatively low (9%) but 70% of the tasks in these jobs could be automated.

The factors that affect employee mobility and the issues that need to be addressed are:

- What will be the appropriate level of education for the future workforce?

60https://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey

61 https://www.cedefop.europa.eu/en

62 https://www.cedefop.europa.eu/files/9121_el.pdf

63 https://www.cedefop.europa.eu/files/9140_en.pdf

64 https://www.ifuturo.org/sites/default/files/docs/automation.pdf

65 http://www.oecd.org/

- How will the need for additional training affect the length of a person's remaining working career? This is particularly true for older workers. - How will the costs of lifelong learning be shared between the worker, the employer and the government?

- How should social security structures be reformed in the AI era? - What work incentives would be sufficient and how could they be improve employment rates?
- How will the reward system and business productivity be organized in the future?

Modernization of the Social Insurance Service66 and Department Work [67]

The social security system must function smoothly as citizens' professional careers diversify. The Department of Labor of the Ministry of Labor and Social Affairs and the HRDA, in cooperation, should prepare both to prevent and to address unemployment that may arise due to automation and changes in the nature and organization of work. Transitions between wage employment and entrepreneurship must be made more flexible. The long-term goal should be to improve and increase the inventiveness of both the social security system and the labor department.

Assessing new social models to support workers' transition to new positions - Considering that automation will lead to changes in the organization of work, we need to ensure that all categories of workers have access to the social state and benefits, e.g. unemployment benefit, maternity benefit, sickness benefit.

By testing new measures with the possibility of continuous review based on results, an environment must be created where all stakeholders Affected employees will be supported during the changes. Due to automation, the reduction of working hours should be assessed. The release of some working time can be compensated by retraining the human resources of the companies and by promoting interpersonal skills and communication.

According to the results of the most recent HRDA study **"Employment Needs Forecasts in the Cyprus Economy 2017-2027 (October 2017)68",** it is expected that an increase in the number of employed persons will be observed in all 3 broad occupational categories (higher, middle, lower level). In lower level occupations, however, it is estimated that the number of employed persons will show an increase in the period

[66] http://www.mlsi.gov.cy/mlsi/sid/sidv2.nsf/index_en/index_en?OpenDocument
[67] http://www.mlsi.gov.cy/mlsi/dl/dl.nsf/index_gr/index_gr?opendocument
[68] http://www.anad.org.cy/easyconsole.cfm/page/project/p_id/404

2017-2027 but overall employment needs will fluctuate at significantly lower levels.

Retraining of human resources
If changes in the labor market and job rotation accelerate, recruitment and upskilling of the workforce will be required. AI will improve employment services and job offers can be better matched to the profile of workers.

According to the results of the most recent HRDA study, **"Employment and Training Needs Survey 2019 (December 2018)69",** businesses reported that in 2019 there are needs for training of their staff in **"Digital knowledge and skills of users"** and in **"Software and applications for specialized topics".** The need to improve digital skills is particularly evident among adults. The HRDA approves and subsidizes training activities, which include, among other topics, new technologies and digital skills with an emphasis on older people. Additionally, it approves and subsidizes training programs for the continuous upgrading of the skills of professionals in the IT sector. It also implements Plans addressed to the unemployed with priority to people belonging to vulnerable groups of the population with the aim of integrating them into employment and enriching their knowledge and skills.

A necessary condition for fully exploiting the growth potential that AI brings to the economy is the retraining and utilization of professionally trained human resources. In order to achieve the above objective, the following actions must be taken:

- Further promotion of actions to inform employers about the HRDA Plans and the incentives they provide for upgrading the skills and professional training of human resources.

- Creation of a human-centered retraining program for professions threatened with extinction due to automation. The employee will be offered an appropriate retraining program based on the assessment of skills, abilities and desires. - Upgrading the state support program for lifelong learning and higher vocational education
in which a system of "fast and continuous" lifelong education should be developed, so that employees can be constantly prepared for new challenges in technology and the labor market.

- Introduction of a student placement program in the industry of European countries through

69http://www.hrdauth.org.cy/easyconsole.cfm/page/project/p_id/501

student exchange program or collaborations between European companies and Cypriot academic institutions.
- Development of new talent. Offering scholarships to renowned universities in TN with the condition that the recipient returns and works in Cyprus ("Singapore model")

Promoting interpersonal and communication skills If it becomes easier to specialize in many jobs, unemployment caused by skill shortages will decrease. The jobs that will increase proportionally will be those that require personal contribution, flexibility, problem-solving skills and creativity. At present, automation and information technology have not been able to replace these skills to a large extent. The importance of presentation skills, communication skills and interpersonal skills is emerging, and should start

throughout the educational system a program for learning these specific skills.

Additionally, a study should be initiated on how training and education programs for the population can be made more flexible to better meet the needs of the labor market in the era of AI.

4.1.2 Broad knowledge of TN and its application

A prerequisite for the widespread use of AI is that the population possesses the appropriate knowledge and skills required for its application. The requirements for the new era of AI must be evident in the curriculum of the entire education system. The importance of skills related to social intelligence will increase.

AI will affect all citizens of Cyprus and it is necessary to ensure that all Cypriots have a basic understanding of how things will work in the new era of AI. All workers regardless of their level of education must have access to appropriate and high-quality vocational training. AI makes it even more important to ensure the competence of people returning to the labour market, e.g. the unemployed. Consideration must also be given to older people who will need these skills to cope with everyday life and take advantage of new opportunities. Lifelong learning, which will become more natural and increasingly important, will be reshaped and the use of AI will be one of the methods that will make learning more personalized and attractive.

Educational system and training of the future workforce The development of AI places new demands on all levels of the educational system and at the same time brings new methodologies and tools that can increase its quality and effectiveness.

- Reform of the education system, promotion of AI through Comprehensive Education Programs. The education system must support new technological skills, especially in the STEM field (Science, Technology, Engineering and Mathematics). There is a need to increase students' abilities and expertise in information technologies, AI and the related ethical issues arising from them. For lower education, it is important to familiarize students with simple and everyday use AI programs such as chatbots. Cultivating the perception of what a program is and what human responses are. That is, to develop the ability to recognize that the operation of a product is likely to be carried out by AI and not by a human.

- Upgrading school equipment for the development of digital literacy. This means improvements in hardware, infrastructure, connectivity and software.
- Development of new skills in teachers. The development of AI, in addition to teaching courses, is also changing the way teachers work. The role of the teacher as the sole source of knowledge no longer exists and his role as a guide and provider of motivation in the learning process is being upgraded. Teachers must acquire new skills for the use of new methods and tools.
- Adoption of the possibilities offered by AI in education. The use of AI tools can increase the quality and efficiency of the learning process. AI can replace the teacher in daily tasks and free up time that can be used for the creative part of the lesson. It can also monitor the progress of students and design personalized programs for further learning.

Creation of an online AI course program in collaboration with the Open University and other educational centers

Massive open online courses are a tool that can be used on a large scale and with greater frequency. This tool allows the creation of high-level study modules and they can be offered extensively, for example, within the framework of applied curricula. This program will create

new possibilities for the effective and further training of individuals in the labor market.

4.1.3 Retention and further training of domestic researchers - attracting top AI experts

The knowledge of experts and researchers in the field of AI will play a central role in building competitiveness during the economic transformation. One of the first

One of the actions that the AI Expert Group should take is to map domestic researchers and experts who are involved in AI technologies, based on specific parameters that will bring to light the country's needs.

Cyprus must ensure the retention and training of domestic workers researchers while at the same time becoming an attractive and alternative country for top experts working abroad. This means that Cyprus must have top-notch know-how in the field of AI
(centers of expertise: e.g. centers of excellence and institutes), as well as testbeds for testing AI solutions (such as AI accelerators). This will significantly help the development of open platforms and innovative solutions. In addition, cooperation between companies, public organizations and citizens will create new opportunities that cannot be found in the Eastern Mediterranean region.

The development of the research environment can be achieved with excellent research teams and the participation of leading researchers who have experience abroad. By securing funding, we must
reach out to leading foreign researchers and provide incentives for domestic researchers to develop a research career in Cyprus. The state should support expert mobility programs between research centers in Cyprus and abroad which will significantly help the development of expertise in Cyprus.

The development of AI technology will require new technical skills in all sectors. It is necessary to take into account the great influence of AI technologies on other sciences and to apply appropriate training to sectors such as medicine, law, tourism, etc.

Additionally, attracting international AI experts to Cyprus will be possible when the state provides easy transition, fast procedures for obtaining a residence permit for non-EU individuals, favorable tax conditions, and offers the necessary services to the families of experts. These services include a sufficient number of international schools and day care centers, as well as employment opportunities for the expert’s partners and family. To attract experts, Cyprus needs to carry out a campaign that corresponds to the image of Cyprus as a pioneer in the utilization of AI in the Eastern Mediterranean.

4.1.4 Upgrading and creating higher education programs in AI

Upgrading existing AI curricula

Some of the universities have a limited range of studies related to AI. The absence of AI studies in applied fields is

a clear gap and needs to be addressed by universities. The absence of applied studies is also evident in universities and vocational training. The first goal should be to upgrade and adapt the existing AI curricula of academic institutions (e.g. Cognitive Systems – Open University, Simulation and Data Science – Cyprus Institute, etc.) to take the above into account. For the proper recognition of AI-related curricula, the core skills required must be defined.

Creation of a new Bachelor's and Master's degree in AI. In the case of creating a bachelor's and master's degree in AI, the program should be modular and have the possibility
its completion by employees and can be applied in many sectors. The studies will be carried out using the experiences and best practices of local and foreign businesses and in cooperation with the public sector. The changing needs and development of the participants in the curriculum will be the main objectives of the program.

The involvement of the Higher Education Quality Assurance and Certification Body (HEQA70) in the process is essential, as it is responsible for ensuring the quality of Higher Education in Cyprus and supporting the procedures provided for by the relevant Legislation for the continuous improvement and upgrading of Higher Education Institutions and their study programs.

One of the biggest challenges in implementing AI is how employees can use it in their work, be trained and acquire the new skills required. At the same time, a new model must be prepared for distributing these training costs among various actors, so that the program can ensure flexible skill upgrading as widely as possible.

[70] https://www.dipae.ac.cy/index.php/el/

5 Developing Ethical and Reliable TN

We are only in the early stages of the advancement of AI and it is necessary to continue the dialogue with all stakeholders. The impacts are difficult to predict for two main reasons: the first reason is the unpredictable pace of technological development and the second reason is that technological development alone does not determine the way in which work and society will change. This determines the need to understand the ways in which AI affects ethical and human rights issues, in order to address issues of trustworthiness of the technology itself.

In the effort of this strategy to ensure the public interest, it sets out specific guidelines for the necessary dialogue between the stakeholders involved, since despite the advantages that this technology is expected to bring, it also raises a number of ethical concerns regarding the impact of technology on society.

The impacts of technology on society are filtered through ethical, social, institutional/ legislative and economic filters:

- A moral filter places restrictions on the ways in which technology is applied so that the personal values, rights and social status of users are not affected. With the application of AI, ethical issues are expected to arise in the future, including the opening of health data, the monitoring (e.g. location) of users, the use of robots in education, or even the use of technology for driving, policing and defense.

- A social filter sets limits on how technology is applied based on the activities of people and organizations. A well-known recent example of a social filter is the way taxi drivers and their support organizations in various countries opposed the competitive activities of Uber and other similar applications.

- An institutional filter will set institutional limits on the ways in which the technology can be applied. This type of institutional filter
  It includes the organizational model of businesses and organizations, the educational system and the labor market.
- A legislative filter places legislative and other regulatory constraints on how the technology can be implemented. For example, the adoption of autonomous vehicles on the road will be delayed until the relevant issues regarding the responsibilities of the new mode of operation are clearly and decisively defined by legislation.

- The biggest economic productivity benefits of new technology solutions often come with a long delay and after a financially costly trial period. This is known as the economic filter and means that many startups are not ready to start testing new and promising technology solutions. Some

Sometimes companies that dominate the market can also make conscious efforts to hinder the spread of new technological solutions.

Small countries like Cyprus do not have absolute freedom to decide on filtering technological impacts beyond certain local contexts. In the context of international competition, a small country cannot take independent decisions to restrict AI for purposes such as protecting certain companies or jobs. The legislation and regulations required for AI must be developed through extensive international agreements. However, Cyprus, as a member of the European Union, and since the EU has already published the first set of guidelines in relation to the *trustworthy* use of AI[71]

, can use this specific EU policy as a basis for the proposed ethical framework for the use of AI in Cyprus.

5.1 Actions for the Development of AI

5.1.1 Ethical questions and issues related to AI

Ensuring the privacy of AI users

The main issue that arises with the use of AI is the safeguarding of personal data and, by extension, user privacy through automation, which is often a consequence of the use of AI.

Ensuring the human rights of AI users

Since the use of AI can affect the behavior and quality of life of AI users, there is a need to identify human rights that may be compromised by the use of specific AI applications.

Ensuring transparency regarding labeling and traceability requirements for AI software

Transparency means that the processes, capabilities and purpose of AI systems are openly communicated and the information that influenced the system's decisions is made available to those directly and indirectly affected, so that evaluation and validity checks can be made. Transparency measures may be required (e.g. traceability, explainability, auditability and transparent communication about the capabilities or design of the system).

Ensuring equality and diversity of AI users

Ensuring equality and diversity will be achieved by ensuring fairness in AI software decisions towards all users, avoiding bias and prejudice.

[71] https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines/1

Ensuring the safety of AI users
For this specific criterion, the software must demonstrate resilience to possible data interception attacks or even in the event of loss of life (use of AI to operate heavy machinery), and include an alternative operation plan in the event of such an attack on the AI system.

Ensuring protection of the environment and social good
To ensure the above, AI products must be environmentally friendly and have positive social impacts by ensuring the sustainable use of natural resources.

Ensuring accountability
Ensuring accountability will be achieved through the ability to control the design and use of AI as well as the scalability capabilities of the software to verify specifications.

Ensuring all of the above will be achieved through continuous evaluation of the processes and practices of designing, creating and using AI software.

Questions
Can a machine be taught ethics? When making decisions, what are the ethical values of AI? What kinds of tasks are suitable for machines? How can we ensure that the data does not have hidden biases that AI can rely on, providing more favorable outcomes for specific groups of the population? These are some of the questions that need to be addressed as part of the development of AI and related measures.

AI applications will affect the security of society in many different ways. AI applications will change service structures, platforms and many other dimensions of security. The impact on the operational reliability of society will also be significant in the digital age, as will citizens' trust in authorities and other members of society. The implications of AI for security are related to ethical issues and the type of ownership structures that the developed applications will have. The application of AI includes a wide range of perspectives on the ethics associated with the use of
technology. Ethical issues can rarely be completely resolved, but the various perspectives related to them can be examined. They need to be discussed and taken into account when developing AI solutions.

In collaboration with the AI Expert Group, we will initiate public discussion on this issue both at events and in open online discussions and will submit the required reports as we proceed and encourage research in this area.

EU Regulations

Today, working groups in the European Commission continue their work on ethical guidelines for achieving trustworthy AI. The Government, in collaboration with the AI Expert Group, should study the decisions and regulations of the European Commission with the aim of highlighting critical legal parameters regarding specific AI applications and the possible amendment of the existing legal framework.

5.1.2 Creation of a National Committee for Ethics and Trustworthy AI (NCATI)

The mission of the National Committee for Ethics and Trustworthy AI of Cyprus will be the continuous monitoring, research, systematic analysis and evaluation of issues and problems related to scientific research, progress and application of computer science in the field of AI, and the exploration of their moral, ethical, social, humanitarian and legal dimensions.

The Cyprus National Committee for Ethics and Trustworthy AI will have the right, whenever and if it decides to do so, to investigate and audit any program that falls under its jurisdiction. Any decision of the EEHATN must be binding.

For the creation of the Committee, the AI Expert Group, in collaboration with the state, will utilize a study that will take into account all the parameters and national characteristics of Cyprus.

6 Annexes: Definitions

6.1 What is Artificial Intelligence?

Artificial intelligence (AI) refers to systems that are characterized by intelligent behavior, analyzing their environment and acting – with some degree of autonomy – to achieve specific goals. AI-powered systems can be software-only, operating in the virtual world (e.g., voice assistants, image analysis software, search engines, speech and facial recognition systems), or AI can be embedded in hardware devices (e.g., advanced robots, autonomous cars, drones, or Internet of Things applications). We use AI on a daily basis, e.g., to translate languages, subtitle videos, or block spam emails. Many AI technologies require data in order to improve their performance. Once they work properly, they can support the improvement and automation of decision-making in the field itself. For example, an AI system will be trained and then used to detect cyberattacks based on data from the network or system in question.

7 Abbreviations

DIPAE	Body for Quality Assurance and Certification of Higher Education
EDPAD	National Open Data Portal
EPSA	Directorate-General for European Programmes, Coordination and Development
IDF	Research and Innovation Foundation
MS	Member States
KPSK	Digital Innovation Hub
SME	Small and Medium Enterprises
PK	University of Cyprus
TEPAK	Cyprus University of Technology
THE	Department of Electronic Communications
AI	Artificial intelligence
ICT	Information and Communication Technologies Sector
API	Application Program Interface
EOSC	European Open Science Cloud
FAQ	Frequently Asked Questions
RFP	Request For Proposal
RISE	Research Centre of Interactive Media, Smart Systems and Emerging Technologies
Start-up	Startup Business
STEM	Science, Technology, Engineering, Mathematics
SWOT	Strengths, Weaknesses, Opportunities, and Threats