

Journal of Politics and Ethics in New Technologies and AI

Vol 3, No 1 (2024)

Journal of Politics and Ethics in New Technologies and AI



Policy Strategies for Training Public Sector Executives to Develop Artificial Intelligence Skills

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doi: [10.12681/jpentai.36596](https://doi.org/10.12681/jpentai.36596)

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RESEARCH ARTICLE

Policy Strategies for Training Public Sector Executives to Develop Artificial Intelligence Skills

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Abstract

The aim of the study is to present the current situation regarding the strategies and policies for the development of AI skills in public sector executives and to establish a holistic training framework based on European and international standards. The paper systematically presents the existing literature on AI, focusing on policy strategies for the training of public sector executives. Hence, the key points of the strategies for AI, as well as the UNESCO Competency Framework for Digital Transformation and AI, the e-CF, the DigComp and the EQF frameworks are presented. Based on the theoretical tools emerged from the literature review, an assessment of the existing situation and the identification of the needs of the Greek reality is presented. Most importantly, the paper attempts to create a holistic four-level strategic framework, which can be used by the public administration as a roadmap to lay the foundations for a basis for public sector training programmes, and which takes into account a number of factors, such as the hierarchical structure of the public administration, the various qualification and competence frameworks, as well as the principles of educational design and adult education.

Keywords: AI, skills, civil servants training, policy strategies, strategic planning.

Introduction

In recent years, Artificial Intelligence (AI) has emerged as an essential phenomenon in strategic research for organizations (Evans & Gawer, 2017), as well as for IT professionals (Purdy & Daugherty, 2017). AI technologies are emerging as one of the important sources of change due to the ever-accelerating pace of innovation (Bundy, 2016). The rise of AI-enabled digital transformation has become an important driver of change in various industries (Rai et al., 2019). Moreover, AI involves fundamental developments taking place at the institutional level and influencing the roles of decision makers and policy experts through the application of advanced technology (Alsheibani et al., 2020).

The public sector could not be left untouched. AI systems are increasingly being implemented in public administrations around the world, while the field of AI has become an active area of research in many cases. Therefore, the potential benefits and challenges associated with AI are an important issue for both scientific research and public policy. Tarafdar et al. (2019) argue that AI technologies do not only

provide value by simply processing data and providing outputs from the organisation, but also by changing their behaviour, processes, policies and practices. Thus, developments challenge executives at the strategic level to rethink their business model, embrace it as a driver for success and adapt strategy and culture to the demands of the digital age. These changes require organisations to develop and enforce their strategies differently.

In the literature, while there are many frameworks on IT governance, only a few though focus on the development of AI skills for managers. Most of these models address either technical or structural aspects of AI (Sirosh, 2017), focus on organizational implementation (Bataller & Harris, 2016) or deal with the process of implementing AI in a public organization (Zheng et al., 2018), while the issue of governance and regulation of AI is partially addressed (Rahwan, 2018; Gasser & Almeida, 2017). The AI strategies published by countries, while covering governance and implementation issues, do not go into depth on issues of training and education of human resources on issues related to cultivating specialized skills in AI.

The present article aims to fill this gap by offering an assessment of the current situation regarding the strategies and policies for the development of AI skills in public sector executives on the one hand, and on the other hand a holistic framework for the development of AI skills in public sector executives through the proposal of an integrated four-level training programme.

Defining AI

The term Artificial Intelligence (AI) was first coined at Dartmouth College in 1956, at a conference of researchers (John McCarthy, Allen Newell, Herbert Simon and Marvin Minsky) from the fields of Mathematics, Electronics and Psychology to study the possibilities of using computers to simulate human intelligence. In fact, however, as a concept it had already appeared in 1950, in a study by Alan Turing (1912-1954), in which the famous English mathematician posed the question: "Can machines think?" (Georgoulis, 2015).

According to Barr & Feigenbaum (as cited in Vlahavas et al., 2020), AI is the area of computer science that focuses on the design of intelligent computing systems. These systems are able to exhibit characteristics associated with intelligence, such as that manifested in human behaviour.

According to the OECD (2019), AI is referred to as a machine-based system that, based on a human-defined data set, is able to predict, propose and make decisions, influencing real and virtual environments. AI systems are designed with different levels of autonomy.

According to another definition, AI technologies are defined as those that can perform or augment tasks, better inform decisions and achieve goals that have traditionally required human intelligence, such as planning, reasoning using partial or uncertain information and learning. AI technologies include robotic process automation, natural language processing, machine learning, computer vision, speech recognition, deep learning, and intelligent robotics (Eggers, Agarwal & Kelhar, 2019).

According to Article 3 of the proposed EU Regulation (2021), a "TN system" means software developed using one or more of machine learning, logic and/or statistical techniques and approaches, for a given set of human-defined objectives, to produce results such as content, predictions, recommendations or decisions that affect the environments with which it interacts. These approaches include: a) machine learning approaches, including supervised, unsupervised and reinforcement learning, using a wide variety of methods, including deep learning; b) logic and knowledge-based approaches, including knowledge representation, inductive (logic) programming, knowledge bases, inference and inference engines, (symbolic) reasoning and expert systems; c) statistical approaches, Bayesian estimation, search and optimisation methods.

AI in the Public Sector: Benefits, Risks, Opportunities and Challenges

Developments in AI have attracted the interest of public sector organisations around the world (Fatima, Desouza & Dawson, 2020; Yeung, 2020). AI systems are being deployed across the public sector (Agarwal, 2018; Desouza, 2018) and are modernising public service delivery (Sun & Medaglia, 2019), however literature and empirical research studies on the implementation and governance of AI in public policy and administration are scarce. The emerging research interest around AI is focused on studies on the benefits, risks and challenges of AI in the public sector (Valle-Cruz, Criado, Sandoval-AlmazÁ & Ruvalcaba-Gomez, 2020; Dwivedi et al., 2019; Sun & Medaglia, 2019; Wirtz & Müller, 2019; Wirtz, Weyerer & Geyer, 2019; Janssen & Kuk, 2016).

AI provides great opportunities for public administration, including the automation of workflow processes (Pencheva et al., 2018; Wirtz et al., 2018) - in a variety of public policy areas from agriculture to public health (Castro & New, 2016) - faster information processing, improved service quality or increased work efficiency (Wirtz et al., 2020; Zheng et al., 2018; Thierer, Castillo & Russell, 2017). Furthermore, AI systems can serve as interfaces between organisations and citizens and as a basis for developing applications to deliver high-quality citizen-centric services (Criado & Villodre, 2020; Sousa et al., 2019), while the adoption of AI technologies in the public sector can promote technological innovation and sustainability to foster an improved ¬-sustainable future (Mahardhani, 2023). Data analysis through intelligent algorithms to enhance decision making and forecasting (Valle-

Cruz et al., 2020; Van der Voort, Klievink, Arnaboldi, & Meijer, 2019; Meijer, 2017), as well as the use of data from social media platforms to design and evaluate public policies (Berryhill et al., 2019), are some more of the benefits of AI in public.

Because of these potential benefits, public administrations and their leadership are increasingly recognising the importance of AI for economic and social progress, applying it to their administration and public infrastructure, as well as supporting AI research. Computational techniques discussed in the literature include machine learning, intelligent agents, big data, robotics, autonomous vehicles, data mining, and chat-bots (Androutsopoulou, Karacapilidis, Loukis, & Charalabidis, 2019; Schuelke-Leech, Jordan, & Barry, 2019; Sun & Medaglia, 2019; Vetrò, Santangelo, Beretta, & De Martin, 2019; Agarwal, 2018; Dobell & Zussman, 2018; Wirtz, Weyerer, & Geyer, 2018; Bredereck et al., 2014). Nevertheless, there are some risks associated with algorithmic discrimination, opacity, human replacement, and increasing digital divide (Margetts & Dorobantu, 2019; Margetts, 2017).

In particular, the potential risks listed in the literature are discrimination, opacity based on the complexity of the algorithms (Cerrillo & Martínez, 2019; Thierer et al, 2017), invasion of privacy (Wang & Siau, 2018; Boyd & Wilson, 2017), entrenching socioeconomic inequalities or increasing the digital divide (Keynes, 2010), reliance on AI, the possibility of making decisions with algorithmic bias (Valle-Cruz et al, 2020; Vetrò et al., 2019). Other negative impacts associated with AI systems in the public sector include technological obedience and loss of control, AI dominance and AI legitimacy, AI paternalism and AI decision making, problems with cybersecurity and, privacy violations (Wirtz & Müller, 2019).

The challenges and opportunities arising from the introduction of AI applications in various dimensions of the public sector are of interest. Key ethical guidelines (Wirtz & Müller, 2019), the interaction between public sector opportunities and cross-sector collaboration (Mikhaylov, Esteve & Campion, 2018), the importance of political engagement with AI in the public sector (Savaget, Chiarini & Evans, 2019) and the formulation of public policies based on the analysis of AI hardware and algorithms (Schuelke-Leech et al, 2019) are listed in the literature as the main challenges facing modern public administration. Furthermore, the transformation of public administration and the potential for smart governments that promote rights efficiency and inclusive technological development to ensure people's digital dignity (Corvalán, 2018), as well as the creation of standards and norms to avoid bias, unexpected outcomes or poor decision-making (Schuelke-Leech et al., 2019) complement the question.

Consequently, there is limited knowledge about the challenges and risks of AI related to the public sector and no consensus on how to address them in the future (Veale et al., 2018; Wang & Siau, 2018). Scherer (2016) highlights the need for a legal system that assesses the benefits and risks in order to find a way to regulate AI and related research without hindering its progress. Boyd and Wilson (2017) highlight the need for local and international policies to reduce the social and personal risks caused by AI. Thus, efforts are being made to find global solutions to these challenges, but many governments and researchers find it difficult to formulate a long-term perspective on how to regulate and interact with the AI market in both the private and public sectors (Cath et al., 2017; Scherer, 2016).

AI Strategic Plans

Governments use various policy instruments (economic incentives, regulatory controls, tax burdens) to achieve different strategic objectives (Borrás & Edquist, 2013). The choice of policy instruments recommends the operationalization of the strategic plan into tangible goals and sets of actions geared towards achieving the overall vision (*ibid.*). Ideally, a strategic plan describes how a state maps out the opportunity space for AI (including how it relates to a country's strengths and weaknesses), which should inform capacity building initiatives, including investment strategies targeting different sectors and industries and the need for regulatory oversight and governance protocols to address the risks posed by AI (World Economic Forum, 2019). Therefore, strategic plans in the public sector provide a valuable roadmap for understanding both the country's priorities and the strategy for achieving those priorities.

Strategic plans for AI are a rich source of information for viewing and understanding how states view the opportunities for public sector modernization and industry transformation, the data and algorithmic elements that need to be managed, as well as planning for capacity building and governance frameworks to support AI development efforts (Fatima et al., 2020). More than sixty countries globally and twenty-four in Europe have already developed national AI strategies, with a particular focus on how these strategies address the challenges of developing and using AI related to the public sector. In a report, the AI Watch presents an analysis of the national strategies of EU Member States, highlighting how Member States aim to enhance the use of AI in their own public sector (Tangi et al., 2022).

The study of the strategic plans shows that countries have realised the huge opportunities that AI offers to increase the effectiveness and efficiency of public services. Moreover, it highlights the need to design policies and actions for the development, adoption and use of ICT in all areas of the public sector, not only as a field of research and innovation, but also as a set of available technologies to improve administration.

For the European continent in particular, a number of policy initiatives have been identified in several EU Member States and associated countries that specifically address the adoption of AI by the public sector (Misuraca & Van Noordt, 2020). Among these initiatives, initiatives that stand out are initiatives that focus on raising awareness among civil servants about the use of AI in the public sector, initiatives to develop internal capacity of public administrations in terms of AI-related skills -with a focus on the need for public organisations to have civil servants with the appropriate competences and skills to develop and/or use AI in their activities- as well as collaborative and discovery learning initiatives on how to develop AI through its application and its real-world impact in flagship projects. Furthermore, as there are many ethical concerns about the use of AI, many strategies explore the ethical implications of its use, while other strategies aim to develop ethical frameworks that will act as guidance specifically for the use of AI by the public sector, in order to foster trust among both public officials and citizens.

The majority of strategies aim to improve the quality, availability and accessibility of public sector data for both internal and external use by public administrations. In addition, a set of policy actions is also noted to stimulate the development and adoption of AI by providing adequate funding and mechanisms to support innovation in the public sector. In reality, innovation in the public sector is often hampered by the lack of appropriate funding systems. Therefore, some strategies underline the need to establish funding programmes dedicated to support the experimentation and development of AI in the public sector.

In terms of data, governments recognise the need for data sharing between the public sector and external stakeholders, but governments need to go beyond simply pushing data onto platforms and take a more proactive role by working with stakeholders to identify data needs (e.g. what data is needed, in what format, with what frequency, etc.) and ensure that appropriate measures are in place to address concerns about data availability and accessibility. The value of cross-border data exchange is also noted, particularly for less technologically developed countries.

Another point highlighted by the research is that all strategic plans emphasise the role of the public sector in designing governance frameworks to promote responsible innovation in AI, but also the need to build capacity for flexible arrangements to keep pace with developments in AI. Given the nature of the strategic plans, among the various initiatives, most countries focus their efforts on integrating AI skills and knowledge into the curriculum of higher education institutions. There is, however, no explicit policy plan for the development of AI skills for civil servants.

Another observation that emerged from the survey concerns the lack of details on the implementation of the projects and the absence of measurements. While rich in information, it is found that most plans

lack details on milestones, how performance will be compared and the targets to be achieved. The plans also tend to ignore fiscal and financial realities, and none of them had a communication plan that could begin to shape discussions and mobilise citizens around collective action on major issues.

Alongside the enthusiasm for AI and its applications, the public sector is called upon to develop mechanisms to balance ambitious plans and practical possibilities to implement advanced solutions to address challenges and seize opportunities for innovation through the adoption of AI systems.

Strategies in the Field of Education for AI

Among the AI strategies discussed above, initiatives to invest in training and capacity building stand out. Fatima et al. (2020) distinguish four areas: a) higher education, b) primary and secondary education, c) vocational training and d) lifelong learning.

The most common practice is capacity building through investment in higher education, with this approach appearing in 31 projects. As an example, the Danish plan mentions efforts to create new programmes in AI and data science (Denmark AI Plan, 2019), while the Finnish plan launches a postgraduate programme for working students (Finland AI Plan, 2017).

Twenty-six projects highlighted the need to invest in AI programmes at primary and secondary school levels to promote interest in science, technology, engineering and mathematics (STEM) education in the early stages of children's education. For example, the Belgian plan highlights the need to make the STEM field of study more attractive, especially for girls, and to integrate algorithmic thinking into the curriculum, while introducing technological skills into existing subjects (Belgium AI Plan, 2019).

Twenty-four projects highlighted the importance of vocational courses as a means of expanding educational opportunities in computer science-related skills. Germany's plan particularly highlights the importance of vocational training particularly for workers belonging to different categories, such as those affected by structural changes, those who wish to be trained for scarce occupations or those whose work is taken over by AI, the possibility to develop and adapt their professional skills (Germany AI Plan, 2018).

Twenty-two projects mention the need to invest in lifelong learning initiatives in order to keep the workforce relevant to the needs arising from the evolution in AI. Typical is the Belgian project which states that a climate should be created to encourage all stakeholders, including trade unions, to invest in and provide incentives for lifelong learning. This can be achieved, *inter alia*, by raising awareness about the possible changes in jobs due to AI. Moreover, this will entail attention to the jobs that are likely to be most affected in the coming years (Belgium AI Plan, 2019).

Developing Digital Transformation and AI Skills for Civil Servants

Public authorities use digital technologies to design and implement public policies, engage with citizens and improve the delivery of public services. Digital transformation can give governments the best chance of developing sustainable, effective and innovative policies that meet the UN Sustainable Development Goals. With the right digital capabilities, policymakers and regulators have the ability to digitally transform their institutions with policies that harness the opportunities offered by new technologies, while navigating the many risks and challenges they can bring (UNESCO, 2022).

The challenges of digital transformation include cultural and organisational barriers, data and infrastructure barriers, and barriers related to human resource skills, among others. In particular, a workplace culture that is averse to experimentation and innovation, combined with a low level of leadership support for pursuing innovative ideas, poses challenges for digital transformation initiatives in governments. Also, lack of investment in ICT infrastructure, lack of available, accessible datasets and lack of mature data organisation, management and governance practices hinder national digital transformation efforts. Finally, capability gaps related to AI and digital transformation are magnified by low investment in digital skills, data analytics, ICT and AI skills and a lack of adaptation of the digital technology and systems supplied to fit the unique context of the organisation.

The challenges of digital governance require a new set of skills and competences from policy makers and public sector executives to ensure that national digital transformation is implemented with a sustainable and equitable approach aligned with the principles of human rights, openness, inclusive access and multi-stakeholder participation (ROAM-X Indicators).¹

To overcome these obstacles and seize the opportunities of digital transformation, public sector leaders and managers need to develop new competences that will equip them with skills to address the complex challenges of digital governance. These competencies include developing enabling frameworks, mitigating ethics and human rights risks, understanding the development and use of digital platforms, and anticipating technological trends (UNESCO, 2022).

The proficiency levels for each competence area are as follows:

1. Broad understanding and knowledge of a subject and topic and the ability to perform some basic tasks related to the subject.

¹ The UNESCO Internet Universality Indicators are a set of 303 indicators designed to assess the state of Internet development at the national level according to the ROAM principles (Rights, Openness, Accessibility, Multi-stakeholder participation).

2. Intermediate. Good understanding of a subject and topic and ability to perform advanced tasks related to the subject. Ability to deal with and provide guidance to others on various tasks related to the subject.
3. Advanced. Advanced understanding and knowledge of a topic and subject area. Demonstrate applied approaches, tools and methods relevant to the topic and ability to mentor others. Also, ability to integrate the specific skill and related practices throughout the organization and to mentor others in this direction.
4. AI-specialist. The competency framework also includes competencies specific to AI, which aim to identify and uncover the most important elements of AI: enhanced understanding of AI (including anticipation of ongoing technological developments), identifying and defining problems where it is important to use AI technologies to improve services or processes, also addressing security and privacy issues.

The Framework also makes recommendations of a general nature, but also to governments, academia and the private sector, which support the development of digital capacities in all public services in countries' digital government ministries and in governments' digital units. With the Competency Framework as a reference point, policy makers can tailor this open resource according to their needs and fulfil their roles as duty bearers (UNESCO, 2022).

The European e-Competence Framework (e-CF)

The European e-Competence Framework (e-CF) provides a structured approach to the assessment and development of skills and knowledge in the field of information and communication technologies. It classifies 41 competences as they apply to the ICT (Information and Communication Technologies) workplace, establishing a common language for competences, skills, knowledge and proficiency levels across Europe. The competences in the e-CF are organised according to five ICT business areas at three levels (intermediate - advanced - digital expert) and related to the European Qualifications Framework (EQF). e-CF is developed by experts and stakeholders and is currently maintained by CEN/TC-428 ICT Professionalism and Digital Competences".

According to version 3.0, e-CF is structured in four dimensions, which reflect different levels of design and are defined as follows:

- Dimension 1: five e-competence domains derived from the ICT business processes "PLAN - BUILD - RUN - ENABLE – MANAGE".

- Dimension 2: A set of electronic reference capabilities with a general description for each capability. It is the core of the framework. 36 competences have been included in e-CF 2.0. These competences are not business sector specific, i.e. they are not related to specific applications such as banking, health, transport, etc. They are generic e-Competences that can be adapted and applied to any industry or business sector.
- Dimension 3: For each digital competence, appropriate proficiency level specifications have been provided, ranging between e-1 and e-5 levels of e-skills. They relate to EQF levels 3 to 8. This dimension includes 'behaviours' and levels of autonomy, creating a bridge from 'organisational' to 'individual' competences. Note that organisational competences are general and broad, whereas individual competences are specific and adapted.
- Dimension 4: Indicates the knowledge and skills embedded in the e-skills. They are not intended to be exhaustive, but are examples of the content of the e-competency. These examples can be useful in defining specific and precise outcomes to be assessed as part of an organisation's competence assessment programmes. In addition, they provide evidence for training institutions to help define learning outcomes and design training initiatives.

The European Qualifications Framework (EQF)

The European Qualifications Framework (EQF) is an 8-level framework, based on learning outcomes for all types of qualifications, which serves as a translation tool between different national qualifications frameworks. The framework contributes to improving the transparency, comparability and portability of individuals' qualifications and makes it possible to compare qualifications from different countries and institutions.

The EQF was created in 2008 and later revised in 2017. It covers all types and all levels of qualifications and the use of learning outcomes makes it clear what a person knows, understands and can do at each level. It is based on descriptive indicators that have been formulated to cover the full range of learning outcomes, regardless of the learning or institutional context in which they were acquired, from basic education to doctoral degrees and from unskilled worker levels to the highest professional levels. The level increases according to the level of proficiency, from 1 (basic skills) to 8 (top scientific performance). The EQF is closely linked to national qualifications frameworks and provides a comprehensive map of all types and levels of qualifications in Europe, which are increasingly accessible through qualifications databases.

The European Digital Competence Framework for Citizens (DigComp)

Digital literacy involves the critical and responsible use of and engagement with digital technologies for learning, working and participating in society. The European Commission published the European Digital Competence Framework for Citizens (DigComp) in 2013 with the overall aim of contributing to a better understanding and development of digital competence in Europe. Since then, the Framework has been updated with new versions, most recently in 2022. The Digital Competences Framework identifies the key components of digital competence and consists of 21 competences divided into the following five competence areas: information and data literacy, communication and collaboration, digital content creation (including programming), security (including digital well-being and cyber security-related competences) and problem solving.

DigComp is aligned with the ESCO data model. Its competences are listed in a hierarchical structure, i.e. the 21 competences are sorted into five competence domains and contain various metadata, such as preferred terms in 28 languages and descriptions. Four levels of competences are distinguished: Basic – Intermediate – Advanced – Digital expert.

The recently updated and comprehensive Digital Competences for Citizens (DigComp 2.2) framework provides more than 250 new examples of knowledge and skills to help European citizens in self-assessment, identifying training offers and finding a job. Thanks to this update, DigComp will continue to play a central role in achieving the ambitious EU targets set by the Digital Decade and the Compass for the digital literacy of the whole population. The new update aims to engage citizens confidently and securely in digital technologies, taking into account emerging technologies such as AI, the Internet of Things, IT or new phenomena stemming from the pandemic crisis, which have led to the need for new and increased digital skills requirements for citizens and workers.

Training of Public Sector Executives in Greece

In Greece, the role of education and training of civil servants has been undertaken by the National Centre for Public Administration & Local Government (EKDDA), which since 1983 has been providing training to the Greek public administration, with the aim of contributing to the development of an effective administration that ensures high quality services to citizens, for the benefit of balanced development and social cohesion. The mission of the EKDDA is to train executives of the administration, of executive and developmental character, to upgrade human resources through continuous education and certified training, to modernize the public sector and its institutions through research, documentation and innovation, and to improve the organization and efficiency of public services (EKDA, 2022).

As a national strategic human resources development institution, the NCDD, among other things, seeks to contribute to the enhancement of the knowledge and skills of serving public administration executives. In the context of its mission, it implements an integrated training programme linked to priority public policies. The integrated training programme is part of the framework of the reforms concerning the Public Administration and the new environment created by the "National Strategy for Administrative Reform".

At the same time and in line with the national digital strategy, the retraining of highly educated employees, the attraction of digital talents, the creation of a mechanism for the systematic recording of digital skills and the interoperability of this mechanism with the EKDDA are frontline initiatives for the Greek public administration (Bourboulis & Niari, 2023). Already, since the summer of 2022, a series of training programmes for public sector executives with a subject of study or work related to computer science has been launched, and it is predicted that by 2025 more than 20,000 public servants will have been trained in basic and specialized digital skills in cloud computing technologies (skilling, upskilling, reskilling) through Microsoft's "GR for Growth" initiative. Participation in the programmes and the opportunity to obtain the corresponding certification is free of charge, while the training is provided in Greek and English. The first phase of the programme was completed in June 2022 for 3,000 civil servants.

Strategic Planning Components

Strategic planning remains the dominant approach to strategy formulation at all levels of government and is an ongoing topic of public administration research and practice. It typically involves analyzing an organization's mission and vision, analyzing the internal and external environment, identifying strategic issues based on these analyses, and defining strategies to address these issues (Bryson, 2018). A recent meta-analysis suggests that strategic planning contributes to organizational performance-and particularly organizational effectiveness-explaining its popularity (Bert, Walker & Monster, 2019).

Focusing on the public sector, it is clear that public administrations have an important role to play when it comes to designing and implementing policies and governance frameworks to support responsible innovation. Ideally, governance frameworks should promote the realisation of benefits and the minimisation of harm, particularly when it comes to how AI systems are deployed in the public sector (Gasser & Almeida, 2017). Defining the vision and objectives in the first instance is key. The objectives should be specific, measurable, achievable, relevant and time-bound (SMART) and take into account the needs and strengths and weaknesses of the Greek reality.

At the same time, strengthening the organisational, institutional and operational capacity of the public administration is a prerequisite and a requirement in order to be able to make interventions for the benefit of citizens, businesses and the public administration itself. Upgrading the human resources of the public sector in the field of AI through the provision of integrated training/education services is considered necessary to respond to the increased needs arising from the introduction of AI in the public sector and to fill the gap due to the lack of skills and expertise.

After all, it is a fact that AI solutions require not only technical skills to be implemented and applied, but also socio-technical skills that combine managerial skills with an understanding of the technology and its potential (Mergel et al., 2019). Employees often lack the necessary AI and data management skills, and public administrations struggle to find and attract talent with the required skills in the market (Mergel, 2019). AI professionals are relatively scarce in the global market, as demand exceeds supply. Moreover, these professionals tend to prefer working in the private sector due to higher salaries (Wirtz et al., 2020). Higher salaries expected by AI experts are also one of the main variables behind the high cost of adopting AI solutions in the public sector (Bughin et al., 2017).

Therefore, the development of specific AI skills development programmes would ensure a sufficient level of independence and a greater ability to create relevant solutions for the specific needs of the public administration. The design of training and education programmes targeted at different groups of civil servants on different topics and for different critical processes can enhance the effectiveness of the public administration. In this direction, the creation of a common governance mechanism for the development and exchange of specific learning materials around common needs could be enhanced through the creation of an AI Hub, sharing experiences and ensuring synergies with academia, the private sector and other countries - at European and international level.

More specifically in Greece, a number of needs and challenges are identified in the Greek public sector, related to change management, awareness raising and motivation for training in AI, the need for changes and adaptation of the institutional framework, as well as changes mainly in terms of strategic targeting and educational planning. Therefore, a comprehensive training plan with appropriate design and the assistance of experts with expertise in AI is needed.

Elements of an Effective Strategy for the Training of Public Sector Executives in AI

An effective AI strategy should align technology choices with the overall strategic vision and incorporate both technical and managerial perspectives. It should be holistic, periodically updated to

keep pace with technological developments, and include a set of options that articulate where and how AI will be used to create value, as well as the resources, governance and controls required to do so. Consequently, anticipate and include organisational changes at all levels to ground the transformative impact articulated in the vision and mission of the agency in question in particular and the public administration in general.

For this reason, the vision needs to be clearly formulated and the objectives need to be specific, measurable, achievable, relevant and time-bound (SMART), taking into account the needs and the strengths and weaknesses of the Greek reality. At the same time, it is important to strengthen the organisational, institutional and operational capacity of the public administration by combining technical, managerial and social skills. In addition, educational and social parameters, such as cultural issues and resistance to change, should be taken into account in order to better promote strategic objectives.

Holistic Training Plan

A holistic and innovative training plan is proposed for the training and education needs of civil servants in AI skills, based on the published strategies of other countries and the European and international qualification and skills frameworks, but also based on the needs and capabilities of the Greek public sector. Specifically, it is proposed to design educational and training programmes addressed to different groups of civil servants on various topics and for various critical processes, through a four-level model, which can ensure a sufficient level of independence and a greater capacity to create relevant solutions for the specific needs of the public administration.

This model includes: (1) strategic level awareness programmes for senior and top-level executives of the public administration, (2) AI skills development programmes, which will be addressed to IT specialists (IT developers) and will include the development, configuration and use of AI tools, as well as semantic classifications, (3) specific programmes for subject matter experts who also specialise in AI issues relevant to their field, and (4) training programmes for end-users. These levels correspond to the hierarchical structure of the public administration in Greece and respond to the challenges and needs of their role. At the same time, they are in harmonious agreement with the levels of the European qualification frameworks, as well as the UNESCO framework: digital expert-advance-intermediate-basic, adding a further level, the strategic level, which also incorporates leadership skills.

In addition, alternative and complementary solutions are proposed that make use of adult education and distance learning methodologies, such as the organisation of professional seminars and workshops

with AI experts, implementation of usage scenarios, online courses, ethical and governance issues of AI.

Actions to encourage structural change, provide incentives and promote partnerships with universities, research institutes, the private sector and public services at national, cross-border, European and international level should also feature prominently in the strategic plan. In this direction, the creation of a common governance mechanism for the development and exchange of specific learning materials around common needs could be strengthened through the creation of a community for AI, sharing experiences and ensuring synergies with academia, the private sector and other countries -at European and international level.

Finally, the promotion of a national framework for the training of civil servants in AI is necessary to take the project forward. The framework will define the objectives and priorities of AI training, standards, procedures and indicators. This framework should ensure that training is tailored to the specific needs of civil servants and that it is available to all civil servants, regardless of their level of experience or education.

Conclusions

Inevitably, AI is an area that drives innovation and thus increases competitiveness. Countries will continue to compete in such a dynamic and rapidly growing field. However, at least as far as the education and training of civil servants is concerned, there is scope for cooperation based on knowledge sharing. In order to advance the debate and the importance of adopting an integrated AI perspective in the skills development of civil servants, there is a need for a holistic and coordinated policy framework for AI. The proposals presented are valuable starting points that can guide the creation of a coherent policy framework. It is of course crucial to involve different sectors in the development of such a framework, as the impact of AI affects all levels. Also, various constraints need to be taken into account and overcome, such as the lack of an integrative policy framework for the public sector, the private sector and civil society. On the one hand, the technical skills needed by public officials are similar to those required in the private sector, and on the other hand, public services face more difficulties in scaling up digital solutions due to infrastructure deficiencies. Above all, however, the lack of a culture of inter-agency cooperation is a limitation, as it provides a basis for fragmented policies and efforts that move away from the objective of formulating coherent policies and strategies with a chance of success.

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