

Public Service in the Age of AI: Institutional Strategies for Future-Ready Skill Development

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Abstract

As artificial intelligence (AI) continues to transform public administration, governments face increasing pressure to ensure that civil servants possess the necessary skills to integrate AI in an ethical, effective, and inclusive manner. Although AI provides enhanced efficiency and responsiveness, its successful deployment depends not only on technical infrastructure but also on human and institutional capacity. This study explores how governments, particularly within the European Union, are developing strategic frameworks to foster AI and digital skills in the public sector, with Hungary serving as a case study. Based on a systematic literature review guided by the PRISMA 2020 framework, the research synthesizes findings from 69 sources, including peer-reviewed studies, policy reports, and national strategies. Thematic analysis highlights key aspects of workforce transformation, including competency frameworks, multimodal training models, and cross-sector collaborations. Notably, Hungary has made notable progress, including launching a national digital skills portal, implementing AI-specific training programs, and reforming public service curricula. However, gaps remain, especially regarding ethics, inclusiveness, and equitable access. The study highlights the importance of institutional learning ecosystems, intergovernmental coordination, and inclusive design. It concludes that building a future-ready public service workforce requires long-term investment in human capital, integrating ethical and digital competencies across governance levels, and aligning national strategies with EU and multilateral frameworks.

CCS Concepts

• Artificial intelligence; • Law; • Sociology;

Keywords

Artificial intelligence, Public service, Future-ready skills, Institutional strategy, Digital inclusion

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1 Introduction

Artificial intelligence (AI) is rapidly becoming a cornerstone of digital transformation in the public sector [1]. Governments around the world are embracing AI to enhance operational efficiency, improve citizen engagement, and strengthen policy outcomes [2] [3]. The European Union has explicitly declared its ambition to “make the public sector a trailblazer for using AI” [4], highlighting the strategic importance of AI in modern governance.

However, successfully adopting AI poses not only technological challenges, but institutional ones too. Realising AI’s full potential in the public sector depends on civil servants’ ability to work alongside these technologies. As EY in 2024 notes, this transformation “is not just about technology – it’s about preparing people to use it effectively” [5]. This requires a fundamental shift in the skills and mindsets of public officials. Essential core competencies include AI and data literacy, ethical awareness, and critical thinking to promote accountability, inclusiveness, and public value through digital transformation.

In 2024, UNESCO reiterated this imperative, stressing the need for public officials to develop new skills to ensure that AI-driven reforms respect human rights and democratic principles [6]. Without these competencies, governments risk misusing AI or exacerbating existing inequalities. The challenge, therefore, is twofold: not only must state-of-the-art digital tools be integrated, but civil servants must also be equipped with the knowledge and judgement to use these tools responsibly. In this respect, cooperation between sectors and jurisdictions will accelerate knowledge transfer and policy coherence [7].

This study addresses a critical and timely question: How can governments strategically equip public servants with the competencies needed to integrate artificial intelligence (AI) into public administration in ways that are ethical, inclusive, and effective? Although there is plenty of literature on the technological dimensions of AI, the institutional processes that enable meaningful and responsible adoption have received less attention. This research examines how national and multilateral strategies are shaping AI-related capacity building, using Hungary as a representative case within the EU context, thereby filling that gap.

The key contribution of this study lies in synthesising institutional, educational and policy developments across different governance levels and translating them into actionable insights. Unlike technical or sector-specific analyses, this research provides a comprehensive overview that incorporates workforce development, ethical governance and institutional learning systems. Adopting a comparative lens and a case study approach, the paper highlights

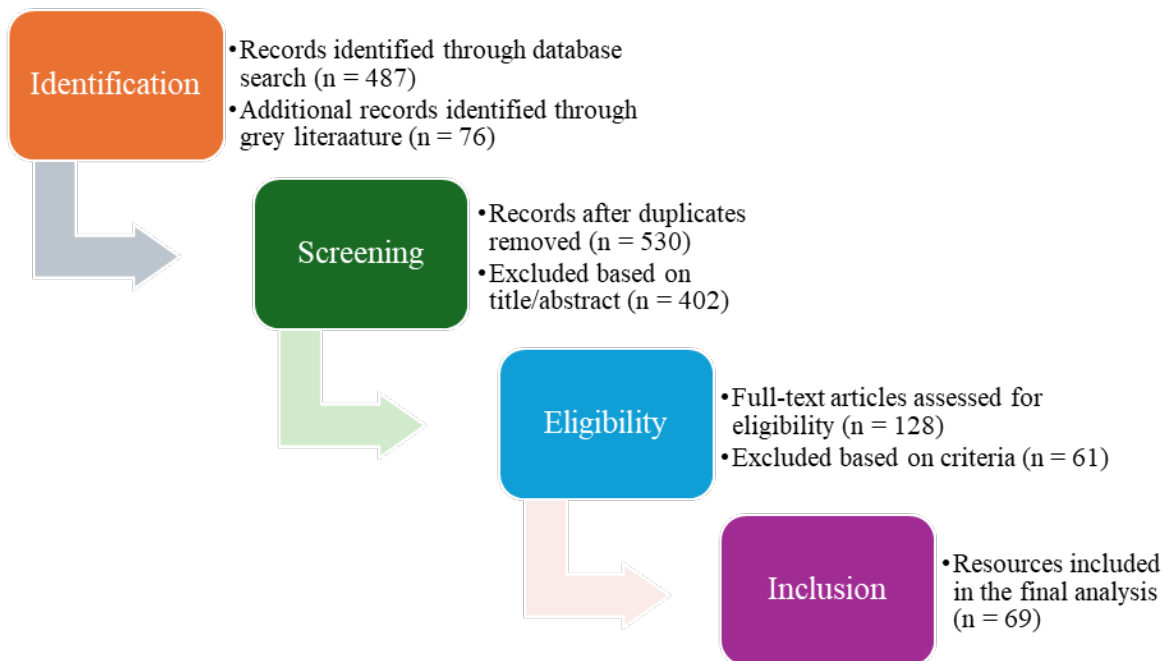


Figure 1: Prisma 2020 Flow Diagram for Literature Review (Source: author)

Hungary’s experience and draws generalisable lessons for other EU and global contexts.

The next section outlines the methodological approach used to investigate how governments are addressing the challenges and opportunities facing public service in the AI era, building on this contextual understanding.

2 METHODOLOGY

2.1 PRISMA 2020 Framework

This study adopted the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework for a systematic literature review. The PRISMA approach was selected for its rigour in ensuring transparency, reproducibility, and methodological clarity [8], particularly for interdisciplinary research at the intersection of AI, public administration, and institutional capacity building. This research uses the literature review method to evaluate various academic sources, related institutional reports (OECD, EU, UNESCO, etc.), national and regional government strategies, and practice-based reports, case studies, and project outputs.

To define the scope of the review, eligibility criteria were established to include sources published between 2018 and 2025 that examined the integration of AI in public administration; the development of digital and future-ready skills among civil servants; institutional strategies for capacity building; and regional and national case studies, especially those focused on Hungary and EU Member States. Foundational works published before 2018 were only included if they were directly relevant to current policy developments. Sources written in languages other than English, studies focusing exclusively on the private sector, and those lacking relevance to skills development or institutional strategy were excluded.

A wide range of information sources was consulted to ensure comprehensive coverage. Academic databases such as Scopus, Web of Science, and Google Scholar provided peer-reviewed materials, while institutional repositories and official portals of organizations like the OECD, UNESCO, and the European Commission were used to access grey literature, strategic documents, and digital competency frameworks. Additionally, relevant national government platforms and AI Watch resources were explored. Manual snowballing from bibliographies of key articles and reports was also conducted to capture additional sources of relevance.

A structured search strategy was employed, combining Boolean operators and keywords such as “AI in public administration”, “digital skills of civil servants”, “future-ready government competencies”, and “Hungary’s AI strategy for the public sector”. The search was updated to June 2025 to incorporate the most recent developments. The PRISMA-guided search identified 563 records (487 academic, 76 grey literature), 69 were included in the final synthesis, of which 34 are cited here. (Annex 1). The process is summarised visually in the PRISMA 2020 flow diagram in Figure 1.

Data extraction was performed using a standardised template to capture key information, such as publication type, country of focus, discussed institutional framework, training modality, target competencies, and any provided empirical results or indicators. The data were synthesised thematically to identify recurring patterns across frameworks, delivery methods, policy interventions, and institutional contexts. Where available, quantitative indicators, such as digital skill levels or training participation rates, were integrated to support the qualitative analysis.

By using the PRISMA 2020 approach, this methodology ensures a robust and replicable foundation for analysing how governments

are building institutional capacities and workforce readiness in response to AI integration in public services.

2.2 Justification for Selecting Hungary as a Case Study

Hungary was selected as the central case study for several strategic reasons. Firstly, it is an EU Member State that has demonstrated an early commitment to AI, as evidenced by its dedicated national strategy which explicitly includes public sector training. Secondly, it serves as a bridge between the advanced digital economies of Western Europe and the emerging digital ecosystems of Central and Eastern Europe, providing a valuable context for understanding the opportunities and constraints of both. Thirdly, Hungary's proactive engagement with EU institutions, such as its 2024 Council Presidency, has provided an opportune basis for evaluating the operationalisation of multilevel governance frameworks at a national level. Moreover, Hungary serves as a useful model for comparative learning because of its integrated approach—linking national AI strategy, civil service training, and EU cooperation frameworks. Few EU Member States have yet achieved this level of policy alignment between digital transformation, education reform, and public administration modernization.

With the methodological foundation now in place, the next section will explore the strategic implications of AI for public services. Key themes from the literature are introduced, including the transformative potential of AI, its practical applications, and the ethical dilemmas it raises. These insights provide a basis for understanding the emerging skill requirements and institutional responses in the public sector.

3 NEW DIRECTIONS FOR PUBLIC SERVICE

3.1 The AI Imperative in Public Service

The potential of AI to transform government work is well-documented. It can automate simple and repetitive cognitive activities, freeing up labour time for higher-value tasks, augment predictive analytics for policy and support user-centric service personalisation [4]. The crisis caused by the SARS-CoV-2 virus underscored how digital government enhances resilience. The OECD notes that robust digital services are crucial for improving the responsiveness and reliability of the public sector [9]. However, realising these benefits requires new organisational foundations, including adaptable governance, resilient IT infrastructure, and forward-looking policies for emerging technologies [10].

The human factor is crucial. Industry surveys of government leaders highlight a paradigm shift in the required competencies of the workforce. A study by EY of U.S. agencies observed that “the true value of AI... is in its potential to enhance human judgment and creativity, underscoring the importance of AI literacy among public sector employees.” [5]. The study also found that critical thinking and strategic decision-making often take precedence over pure technical skills in AI initiatives. AI proficiency now encompasses an understanding of ethical implications and societal impacts, as well as programming. Employees must be equipped to ask the right questions of AI systems. In short, public servants who are ready for the future need a blend of digital, analytical, and soft

skills — from data literacy to adaptability and leadership — to work alongside AI.

3.2 AI Applications in Public Services

AI is transforming the delivery and management of public services in various sectors by offering innovative solutions that enhance efficiency, responsiveness, and personalisation. In healthcare, for example, AI-driven tools have been instrumental in enabling predictive diagnostics, tailoring treatments to individual needs, and delivering real-time analytics. During the pandemic, these technologies played a pivotal role in early detection, resource allocation, and emergency response coordination, significantly contributing to public health resilience [11]. Beyond crisis response, AI continues to support long-term health strategies by integrating wearable technologies, telemedicine platforms, and electronic health records enriched by machine learning algorithms.

In the context of smart cities and urban planning, AI applications play a key role in enhancing the efficiency and sustainability of urban systems. Urban planners use technologies such as machine learning models to dynamically allocate resources, manage traffic flow, and optimise waste collection and energy distribution. These systems help to achieve environmental goals and enhance quality of life in urban environments [12]. Furthermore, integrating AI with Internet of Things (IoT) devices enables real-time monitoring of city infrastructure and citizen behaviour, facilitating more responsive and adaptive urban management.

AI integration has also brought significant benefits to governance and citizen services. Governments are increasingly using AI to automate repetitive administrative tasks, carry out in-depth policy impact analyses and enhance communication with the public. AI-powered tools such as chatbots and virtual assistants are streamlining service delivery by providing faster and more accurate responses to citizen enquiries. Meanwhile, the use of data analytics is enhancing the capacity for evidence-based policymaking, ensuring that public decisions are grounded in timely and relevant information [12]. Furthermore, living labs — collaborative platforms where citizens actively participate in designing and testing AI-enabled services — reflect a growing trend towards participatory and inclusive innovation in public administration [3].

3.3 Challenges and Ethical Considerations

Integrating AI into public sector operations presents a complex set of challenges and ethical considerations that must be addressed to ensure its responsible and equitable implementation [13]. Data privacy and algorithmic bias are among the most pressing concerns. As AI systems increasingly influence public decision-making processes, there is a serious threat to institutional legitimacy and public trust posed by the potential for algorithms to perpetuate systemic biases, especially when operating without sufficient oversight. Furthermore, the vast amounts of personal data required to power these systems heighten the risk of privacy breaches and misuse. These ethical dilemmas highlight the urgent need for transparency in algorithm design, robust audit mechanisms and inclusive development practices that consider diverse social contexts and populations [14].

Table 1: Example of Italy’s Framework (Source: author)

Area	Key Competences	Proficiency Levels (example)
Data and Information	Manage data and digital content	Basic / Intermediate / Advanced
Communication	Communicate within and beyond the administration	
Safety	Ensure digital information security	
Online Services	Design, maintain, and evaluate e-services	

Equity in access and representation is also a critical concern when it comes to the adoption of AI. Without intentional safeguards, AI systems may inadvertently marginalise certain communities, particularly those underrepresented in training datasets or facing barriers to digital access. Disparities in digital literacy, connectivity, and participation can further entrench existing social inequalities, rendering public services less accessible to those who need them most. To counteract these effects, governments and institutions must prioritise inclusive design principles, adopt equity-focused policies, and implement continuous monitoring systems to assess and mitigate the impact of AI deployment on different demographic groups [15].

Although technological capabilities are expanding, realising the benefits of AI hinges on human capital being ready. The next section, therefore, shifts the focus from institutions to individuals, examining the evolving competencies that civil servants must acquire to operate effectively and ethically in an AI-driven public sector.

4 NEW DIRECTIONS FOR CIVIL SERVANTS

4.1 Future-Ready Skills for Civil Servants

So, what exactly are “future-ready” skills for public service? Broadly speaking, they encompass digital literacy (safely and effectively using ICT tools), data skills (including analytics and data management), AI literacy (understanding AI concepts and limitations), and creative and cognitive skills (such as critical thinking, problem solving, and communication) [16]. Global frameworks help to define these competencies. For instance, UNESCO has developed a Digital Competency Framework for Civil Servants to guide ICT and AI capacity building [6]. Similarly, the EU’s DigComp framework (for citizens) and its variants for public administration list key digital skills.

In practice, many countries are formalising these skills. OECD research shows that competency frameworks provide a strategic foundation for digital government skills [17]. These frameworks usually define subject areas (e.g., data management, service design, cybersecurity, and awareness of emerging technologies) and proficiency levels. Italy’s 2020 Digital Competence Syllabus for Public Administration, for example, uses *four skill areas* (data and information, communication, safety, online services) and three proficiency levels (basic, intermediate, and advanced), with detailed descriptions for each level. A civil servant with basic proficiency in “managing data” must, for example, be able to distinguish between data and information and conduct effective online searches [18]. These models help governments to identify skill gaps and to tailor training. Table 1 illustrates an example of Italy’s framework.

Beyond technical skills, ethical and cognitive competencies are also crucial. As one survey notes, staff must be made to “realise their ethical responsibilities around AI usage” [19]. Future public servants should be agile learners who can continuously update their digital skills. Therefore, a successful strategy combines digital training with broader personal development.

4.2 Development of Future-Ready Skills in Public Service

As AI becomes increasingly embedded in public sector operations, the development of future-ready skills among civil servants is essential to ensure that governments can respond effectively to technological change. Strategic workforce transformation is at the heart of this effort. To fully harness the potential of AI, public employees must not only possess baseline digital literacy but also demonstrate adaptability and a willingness to continuously learn [20]. AI-related competencies, such as data analytics, ethical reasoning, and the ability to collaborate effectively with AI systems, should be systematically embedded within public administration through ongoing education and professional training [21].

Institutional capacity building is equally important, involving the creation of structures and ecosystems that support lifelong learning within the public sector. This requires sustained collaboration between government agencies, academic institutions, and the private sector in order to jointly develop curricula and programmes that respond to a rapidly evolving digital environment [22]. Professional development efforts should be centred around initiatives such as digital leadership academies, AI literacy workshops, and stackable microcredential programmes. These programmes build technical skills and encourage strategic thinking about the role of technology in governance.

However, skill development and training alone are insufficient if there are no parallel changes to organisational culture. For AI to be effectively integrated into public service delivery, institutions must also foster a culture of innovation, openness, and flexibility [23]. This requires proactive change management strategies that include strong leadership support, incentive structures that reward learning and experimentation, and mechanisms that facilitate cross-sectoral collaboration [24]. Collaboration between academia, industry, and government accelerates training innovation. Hungary’s Ludovika University of Public Service and networks such as ReSPA support curriculum updates and regional cooperation [25].

Public institutions can become more resilient, adaptive, and capable of navigating the challenges of the AI era by aligning workforce transformation, institutional learning, and organisational culture.

As the development of future-ready civil servants gains momentum, attention must also be paid to the institutional systems that

support, structure, and sustain these competencies. The following section explores how governments are developing institutional strategies to expand digital skills training and ensure the long-term transformation of public services.

5 NEW DIRECTIONS FOR INSTITUTIONS

5.1 Institutional Strategies for Skill Development

In order to prepare public administrations for the challenges posed by digital transformation and AI, governments must establish robust institutional frameworks and programmes dedicated to developing skills [26]. Several key strategies have emerged across Europe and beyond, reflecting an evolving, comprehensive approach to building capacity in the public sector.

A foundational step is to develop and adopt competency frameworks and assessment tools. National or sector-specific digital and AI competency frameworks that are aligned with established EU or United Nations (UN) templates can provide a clear roadmap for skills development. Some EU countries have adapted the European Commission's DigComp framework for civil servants, while UNESCO's competency framework offers a global template that can be localised for different countries [6]. In parallel, systematic skills assessments, whether through self-surveys or diagnostic tools, enable governments to identify existing gaps, target training accordingly, and monitor progress over time.

Effective training programmes must offer continuous and blended learning opportunities. These should include a variety of formats, such as e-learning modules, interactive workshops, simulations, serious games, and immersive experiences like "learning expeditions", to engage diverse public sector audiences [4]. Blended learning models that combine online and in-person formats have become standard practice in many countries. Austria's Public Digital Campus, which was launched in 2024, is a prime example of this approach. It offers over 50 digital skills courses for civil servants in both online and face-to-face formats [27]. Webinars, podcasts, and communities of practice also enable time-constrained professionals, such as senior managers, to access knowledge and peer support more flexibly [28].

Governments are also increasingly adopting policies that promote lifelong learning and systematic reskilling. For example, Hungary's digital strategy includes personalized learning paths supported by AI-based career guidance tools and e-coaching systems, particularly targeting employees vulnerable to automation-driven job displacement [29]. Initiatives such as Hungary's Probono portal allow civil servants to manage individual learning plans and access relevant resources. To further incentivize participation, financial or career-related motivators, such as promotion criteria linked to upskilling, can be introduced to create a culture of continuous professional development.

In addition, specialised training for managers and IT professionals is essential. While leaders must develop a strategic understanding of AI, technical staff require in-depth, hands-on implementation skills. Hungary's national AI strategy explicitly calls for raising AI awareness among managers and expanding technical expertise in key sectors [29]. Similarly, an EU initiative aims to enhance

the skills of civil servants by training 40,000 officials in both foundational and specialised digital competencies [28]. Ireland, for example, has introduced short, targeted certificate programmes, such as AI Foundation courses, designed to raise civil servants' baseline knowledge [18].

These efforts are most effective when embedded in cross-institutional collaboration. Partnerships between public administration schools, universities, and industry stakeholders can promote innovation and ensure training remains relevant. For instance, the Ludovika University of Public Service in Hungary has started to incorporate AI and data science into its curriculum for prospective civil servants. Regional cooperation is also gaining traction: the Regional School for Public Administration (ReSPA) and events such as the 2024 DISPA conference in Budapest have provided a platform for public service training institutes across Europe and the Balkans to share AI curriculum models and best practices [30]. Furthermore, European Digital Innovation Hubs are being set up to support SMEs and public institutions in adopting AI.

Institutional strategies are increasingly being implemented within multimodal learning ecosystems, which combine various training methods and outreach formats. For example, Latvia's EU-funded Digital Academy for Public Administration employs an integrated model featuring webinars, modular courses, summer schools, and professional communities, such as digital ambassadors. This ensures coverage of both technical and strategic dimensions. France's Public Digital Campus takes a similar approach, offering hybrid learning formats including serious games, simulations, and podcasts tailored for senior officials [27]. This multimodality enables public institutions to cater to different learning styles and roles within the civil service.

To ensure long-term impact, efforts to develop skills should be embedded within human resource management systems. Belgium offers a compelling example of this: its federal training framework aligns civil servant development plans with a national digital competence model, using the integrated platform, talent.belgium.be, to monitor learning trajectories and performance outcomes. Furthermore, assigning a Single Point of Contact (SPOC) for learning within each agency helps to tailor learning pathways and ensure accountability for results [27].

Together, these institutional strategies offer governments a comprehensive blueprint for futureproofing their public service workforce and supporting effective digital transformation. While these strategies offer guidance on developing the skills required for public service, it is important to consider the potential risks and limitations of AI integration. To ensure responsible and equitable AI adoption in public administration, concerns about ethical implications, data privacy, and the digital divide must be addressed [31].

5.2 Institutional Strategies for Ethical and Effective AI Integration

Successful and responsible integration of AI into public sector operations depends on strong institutional strategies prioritising ethical considerations and effective governance. A key part of this process involves developing regulatory and governance frameworks that offer clear direction on the use of AI technologies. A cohesive

approach requires governments to formulate national AI strategies, adopt robust data governance policies, and set up independent bodies to oversee ethics and ensure accountability. Institutions must incorporate principles relating to data ownership, algorithmic transparency, and public accountability into their operational standards [13]. Such frameworks help to mitigate the risks associated with AI and build public trust in digital government systems.

Beyond domestic regulation, cross-border collaboration and international benchmarking are vital in shaping the implementation of ethical AI. Governments are increasingly recognising the importance of collaborating to share best practices, evaluate progress, and develop interoperable standards that can be applied across borders. Multilateral organisations such as the OECD are leading the way in establishing governance frameworks that support the ethical use of AI in public administration, thereby promoting consistency and cooperation across national boundaries [17]. This kind of collaboration fosters innovation and ensures that AI technologies are used in ways that uphold democratic values, inclusivity, and the public good.

5.3 Multi-level Governance and Coordination

Implementing skills strategies requires coordination between different levels of government. The EU establishes overarching objectives (e.g., ensuring that 80% of adults possess basic digital skills by 2030) and allocates funding (e.g., through the Recovery and Resilience Facility (RRF) and the Digital Europe Programme). Member states then translate these into national strategies and projects. For example, Hungary's National Digital Decade Roadmap and Recovery and Resilience Plan allocate significant funding to digital education, workforce training, and modernising e-government. The EU's Digital Skills and Jobs Platform tracks progress by country, showing that Hungary's basic digital skills rate rose to 58.9% in 2024, which is above the EU average [32].

At regional and local levels, multi-stakeholder partnerships are essential. Organisations such as ReSPA (covering the Western Balkans and the EU) and EUPAN (the Public Administration Network) facilitate the sharing of good practices through the creation of forums. For instance, with EU support, Lithuania and Latvia have developed national competency frameworks and digital ambassador networks [27]. UNESCO explicitly recommends "facilitating knowledge exchange and mutual learning through multilateral cooperation and adapting AI competencies to local needs" [5]. This means that the ministries responsible for digital affairs, education, and public administration should coordinate curricula and recognise each other's training certifications.

The challenge of organisational and cultural barriers must be jointly addressed. Governments often have risk-averse cultures and legacy processes that resist change. UNESCO notes that insufficient investment in digital and AI skills is a common barrier [5]. Therefore, high-level political commitment is required. During its recent EU Council Presidency, Hungary highlighted AI in civil service training, and the memoranda of understanding (MoUs) between EU and national institutes at conferences exemplify how leadership can drive multi-level skill initiatives [29].

The effectiveness of these institutional strategies is best illustrated through their national-level implementation. The next section uses Hungary as a detailed case study to show how an EU member state is turning strategic goals into practical reforms that strengthen institutional capacity and workforce readiness.

6 CASE STUDY: HUNGARY

Hungary exemplifies the opportunities and efforts in this field. The Hungarian AI Strategy (2021) places a strong focus on education and training. It calls for the teaching of mathematical and logical skills from an early age, the introduction of AI modules at university level, and the creation of AI PhD programmes. The strategy also emphasises lifelong learning and proposes an AI Challenge to train 100,000 citizens in the basics of AI and raise awareness among another million. It also plans to establish a personalised career advice system to facilitate reskilling. Of particular relevance to public services, the strategy explicitly includes "training experts in priority sectors and the public administration" and "expanding the circle of managers aware of AI technologies" [29].

These high-level plans are translated into concrete actions. For example, Hungary has created a digital competence framework for its public service that is aligned with EU models, and it has also established a Pro Bono learning portal for civil servants. Modular courses on e-government and digital management are run by the Ludovika University of Public Service in Budapest. The country's Recovery and Resilience Plan allocates billions to digitising education and training, including launching competency centres in schools and adult learning programmes. During Hungary's EU Council Presidency in 2024, a conference on AI in public service training was hosted in Budapest, signalling regional leadership [29]. Survey data from the conference (EIPA studies) confirmed that EU public administrations are at different stages of AI adoption and highlighted Hungary's proactive approach to developing the skills of its civil servants.

Empirical indicators also demonstrate Hungary's progress and areas for improvement. According to the EU's Digital Decade report, 58.9% of Hungarians had basic digital skills in 2024, which was higher than the EU average. However, only around 4.2% of the Hungarian workforce are ICT specialists, which is slightly below the EU average and suggests a need to cultivate more technical talent. Hungary's Digital State Strategy, therefore, focuses on data-driven administration and smart regions, as well as improving literacy in disadvantaged areas [32]. These measures, combined with enhanced ICT infrastructure (e.g., faster internet and the expansion of e-ID), aim to create an environment in which public servants can more easily develop their skills and collaborate with private tech partners.

In addition to national strategies, Hungary has implemented concrete, AI-driven systems within the public administration sector. Projects such as the AADM allow for the automation of administrative workflows, enabling data retrieval and decision-making without manual intervention, for example, in cases of traffic violations. The National Ambulance Service has also adopted predictive AI models to optimise emergency responses [33]. These examples

highlight Hungary’s practical use of AI in governance, demonstrating the potential and challenges of balancing efficiency with accountability and fairness.

In summary, Hungary’s case highlights the importance of aligning national AI and digital strategies with workforce training. It demonstrates that policy ambition (in the form of an AI strategy), educational reform (in the form of new curricula), and funding (in the form of RRP projects) must work together. Other CEE countries are facing similar challenges: they need to catch up with digitalisation while also trying to avoid losing tech talent to other countries. Sharing Hungary’s experience through EU networks or regional forums could benefit the entire region.

Hungary’s approach is a concrete example of how national AI strategies, educational reforms and cross-sector partnerships can be aligned to support digital transformation in the public sector. This discussion draws on this case study and broader European trends to identify principles and recommendations for other governments seeking to adopt similar models.

7 DISCUSSION

7.1 The Role of Institutional Strategies

The experience of Hungary, along with other European and Central and Eastern European (CEE) governments, provides valuable insights into developing institutional strategies for creating future-ready public sector skills in the era of AI. Several guiding principles emerge that can shape effective, inclusive, and sustainable approaches.

First and foremost, early and broad investment is crucial. Developing essential digital, data, and AI skills is not a one-time effort but a long-term pursuit that requires ongoing funding and policy support. Short-term workshops or standalone digital courses cannot replace the integration of digital literacy and AI understanding into basic education and lifelong professional growth. As UNESCO warns, “AI and digital competency gaps are magnified by low investment in digital, data, IT and AI skills” [5]. Public budgets, complemented by EU funding mechanisms, should therefore prioritize human capital development alongside investments in digital infrastructure such as hardware and software.

Adopting human-centred approaches to training is equally critical. Effective capacity building involves more than just technical instruction; it must also incorporate cognitive, ethical, and collaborative skills to empower civil servants to think critically about the use of AI. As EY’s findings emphasise, the ability to interpret AI outcomes and formulate the right questions is just as important as understanding the technology itself [5]. Building on these findings training should therefore move beyond passive lectures to incorporate role-playing, project-based learning, and simulation-based exercises. These interactive formats can enhance critical thinking and ethical reasoning. Additionally, creating spaces for peer learning and mentorship can help disseminate tacit knowledge and boost confidence, particularly among staff with less digital experience.

The diversity of roles within the public sector necessitates a variety of learning formats that can adapt to different needs. Not all civil servants require the same level of training: policy analysts, for example, may benefit from modules in data science or AI policy, while local administrative staff may need to develop digital

literacy skills. A blended model combining microlearning (such as short videos, quizzes, and self-paced tutorials) with immersive experiences (such as hackathons, design sprints, and innovation labs) has shown promise [27]. Using micro-credentials or digital badges can provide incremental recognition and encourage ongoing engagement, fostering a culture of lifelong learning.

In order to remain current and effective, training ecosystems must leverage strategic partnerships. Collaborating with public institutions and external actors, such as universities, technology companies, and civil society organisations, can provide access to up-to-date expertise and resources. Co-developing courses with academic departments, technology consortia, or non-governmental organisations (NGOs) ensures that the content is relevant and of good pedagogical quality. Public sector training bodies can adapt open educational resources (OER) or massive open online courses (MOOCs) for local legal and policy contexts, enabling cost-effective expansion while maintaining relevance [34].

In a rapidly changing technological landscape, ongoing evaluation and programme adjustment are essential. Governments should regularly assess their workforce’s digital skills using tools such as self-assessments, surveys, or performance audits [27]. These evaluations can inform targeted interventions and guide resource allocation. Digital monitoring platforms, such as Belgium’s national talent portal, also allow institutions to track participation in training programmes and measure their impact. EU-wide benchmarking efforts, including the OECD Digital Government Index, provide additional tools for identifying systemic gaps and encouraging shared learning across countries.

Finally, any training strategy with a view to the future must emphasise inclusiveness. Without intentional outreach, the digital transformation process could exacerbate existing disparities. Additional efforts are required to engage underrepresented or vulnerable groups, such as women, rural workers, and older civil servants. Local governments and community organisations can play a crucial role in providing training materials in accessible languages and improving access. Hungary’s approach, which supports disadvantaged regions, promotes intergenerational education initiatives, and introduces early exposure to logic and AI concepts in schools, demonstrates how digital inclusion can be incorporated into national strategies [29].

Figure 2 illustrates a conceptual framework showing how institutional strategies, training models and civil servant competencies interact to shape governance outcomes.

7.2 Challenges and Risks in Institutional AI Skill Development

Although institutional strategies for developing AI skills offer promising pathways, several challenges persist. A major barrier is organisational inertia, particularly within public administrations that have rigid hierarchies or outdated civil service laws. Risk-averse cultures may discourage experimentation or innovation, even when digital tools are available. Often, investments in training are fragmented or underfunded, resulting in inconsistent implementation across departments and jurisdictions.

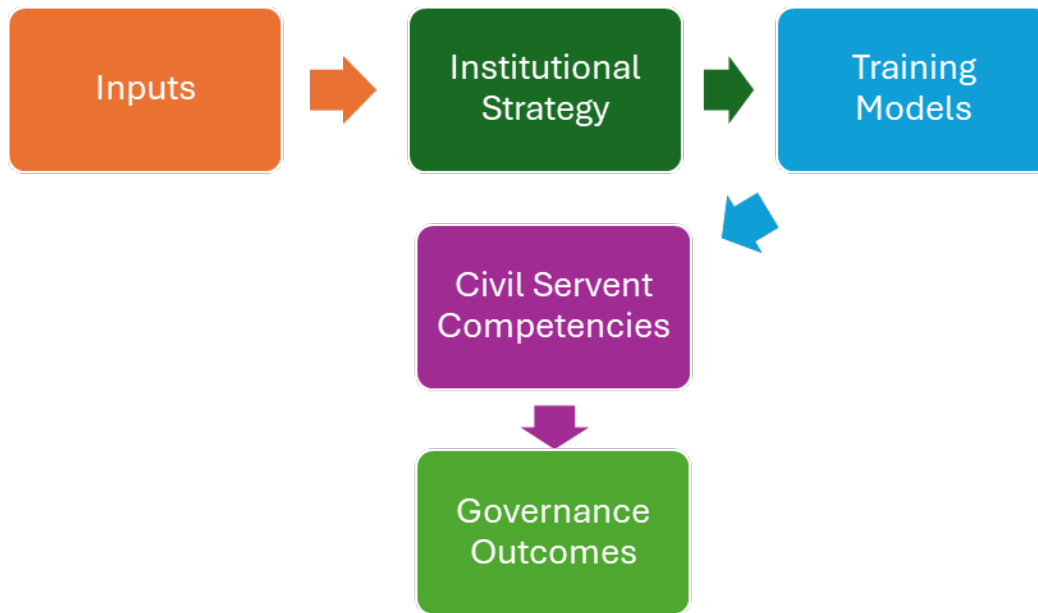


Figure 2: Conceptual framework (Source: author)

Additionally, there is a risk of placing too much emphasis on technical proficiency at the expense of ethical and cognitive competencies. Without a balanced approach, training programmes may produce civil servants who can use AI tools, but who lack the judgement to evaluate their wider societal implications. There is also a risk that AI literacy initiatives could exacerbate existing inequalities by favouring digitally savvy employees while neglecting older, rural or socioeconomically disadvantaged workers. These risks emphasise the need for intentional inclusivity and structural reform.

7.3 Integrating the Citizen Perspective

Institutional capacity building should not be carried out in isolation; the ultimate measure of success is whether AI enhances public value and improves outcomes for citizens. This requires the incorporation of feedback loops that assess internal skill gains, as well as service accessibility, responsiveness and trust. Participatory initiatives, such as the co-design of digital services by citizens or public consultations on algorithmic governance, complement internal training. Hungary’s use of living labs and civic hackathons offers a model that can be replicated by other countries.

Furthermore, the integration of AI should be evaluated against key citizen-facing outcomes, such as reduced service times, improved benefit targeting, and greater transparency. Periodic citizen satisfaction surveys and digital inclusivity audits can help governments adjust their training priorities to better align with public expectations and needs.

7.4 Comparative Snapshot of AI Skill Strategies in EU Countries

Focusing on AI and inclusion measures in public service training strategies across selected EU countries reveals how different

European nations are adapting their strategies to develop AI competencies and promote inclusivity. For example, Hungary emphasises reskilling in the public sector through blended, modular training, and prioritises outreach to rural and disadvantaged communities. Austria and France both utilise their Public Digital Campus platforms; Austria offers flexible formats to serve all age groups, while France employs interactive methods such as games and simulations to train senior officials, focusing on inclusive engagement. Ireland targets foundational AI knowledge through microcredential programmes, aiming to improve gender balance and digital access. Latvia uses its Digital Academy for webinars and summer schools, emphasising multilingual delivery and local needs. Together, these strategies demonstrate a unified yet diverse effort across EU countries to strengthen AI competencies while addressing digital inclusion. While Austria and France emphasise broad digital literacy and leadership training, Hungary’s approach uniquely integrates these efforts within its national AI and digital state strategies. This makes it an instructive case for understanding how mid-sized EU Member States can operationalise multilevel governance goals through targeted public service training. Table 2 provides a comparative overview of public service training strategies in EU countries. Together, these principles provide governments with a framework to ensure that their public sector workforces are prepared for the challenges of AI and actively promote the responsible and fair use of AI.

The preceding discussion summarised the key findings and suggested practical strategies for improving institutional preparedness in the era of AI. In conclusion, the final section reiterates the study’s main contributions and considers the implications for future public service reform at all levels of governance.

Table 2: AI Skill Development Strategies in EU Countries (Source: author)

Country	Competency Framework	Training Format	Key Focus Areas	Inclusion Measures
Hungary	National AI + Digital	Blended, modular courses	Public sector AI, reskilling	Focus on rural and disadvantaged
Austria	Public Digital Campus	Online + in-person	General digital literacy	Flexible formats for all ages
France	Public Digital Campus	Games, simulations	Senior official training	Simulation-based inclusivity
Ireland	AI Certificate Courses	Microcredentials	Entry-level AI and data science	Gender balance and online access

8 CONCLUSION

As AI continues to transform public administration, the development of institutional strategies for workforce development has become a governance necessity. To this end, governments must adopt a multifaceted, multilevel approach incorporating clear competence frameworks, diverse lifelong learning opportunities, cross-institutional collaboration, and continuous investment. The European Union is offering a strategic vision through initiatives such as the Digital Decade and the Skills Agenda, and Member States, including Hungary, are actively translating these goals into specific national policies and programmes. These efforts are supported by global organisations such as the OECD and UNESCO, which provide guidelines on best practice and emphasise the importance of human-centred, inclusive capacity building.

Central to this transformation is the need for public institutions to lead by example. This means integrating AI tools into their operations and ensuring their workforce is prepared to use them responsibly and effectively. The key to unlocking the full public value of AI lies in building a team of future-ready civil servants who are equipped with digital, data, and cognitive skills. This preparation encompasses more than just technical proficiency; it also includes fostering ethical awareness and adaptability. This ensures that the deployment of AI aligns with democratic values and public interests.

Limitations and Future Work: While this study offers a comprehensive synthesis, it relies on publicly available reports and secondary data. Future research could include empirical fieldwork, interviews, or surveys to assess how institutional strategies translate into measurable skill outcomes.

Ultimately, integrating AI into the public sector is more than just upgrading technology; it's about reimagining public service itself. An approach to skill development that is people-first, equity-driven and future-oriented is essential. This study shows that although technology evolves quickly, human and institutional adaptation necessitates sustained dedication, cross-sector collaboration, and inclusive policymaking. Governments must recognise digital literacy, ethical reasoning and adaptability as public goods that are just as vital to democracy as infrastructure or education. Only by placing people at the centre of AI transformation can the public sector deliver smarter and fairer services.

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A APPENDICES: Comprehensive List of the 69 Included Studies (PRISMA Final Synthesis)

A.1 Academic and Peer-Reviewed Sources

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