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Generative artificial intelligence, present and perspectives in public administration

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***Abstract*:** Artificial Intelligence (AI) is playing an increasingly important role in public administration, offering innovative solutions for efficiency and better public services. The application of AI in public administration aims to modernise and streamline the services offered to citizens. AI contains advanced algorithms, neural networks, and machine learning techniques to improve performance and efficiency over time. Smart algorithms, responsibly implemented, could help governments enhance service delivery and strengthen citizen engagement in local, city, regional, and national administrations around the world. Governments in some states have discreetly launched pilot programs to test developing AI applications, demonstrating an enthusiasm for technology at least as great as that in the private sector. By utilising AI, public administrations can automate repetitive processes, optimize resource usage, and improve interaction with the public. The purpose of the research is to show the extent and scope that AI tools integrated into organisations have in almost all areas of the public and private sectors in general, and state administrations in particular. The research objectives were: to analyse the dynamics of investments in AI tools; to discover the main services in state administrations that can be better performed using AI; to analyse the risks; and to highlight the perspective of development and integration of AI in public administrations of a few European states. The research is based on a comparative analysis of the implementation of AI tools across fields, components, and regions at the European level mainly, but also for Romania. The analysis period is 2021-2030. The results show a continuously increasing trend and an ever-faster rate of assimilation of AI tools in the field of public administration in an increasing number of states from most developed regions worldwide.

Keywords: artificial intelligence; generative artificial intelligence; public administration, public services.

JEL: H5; H7; R5.

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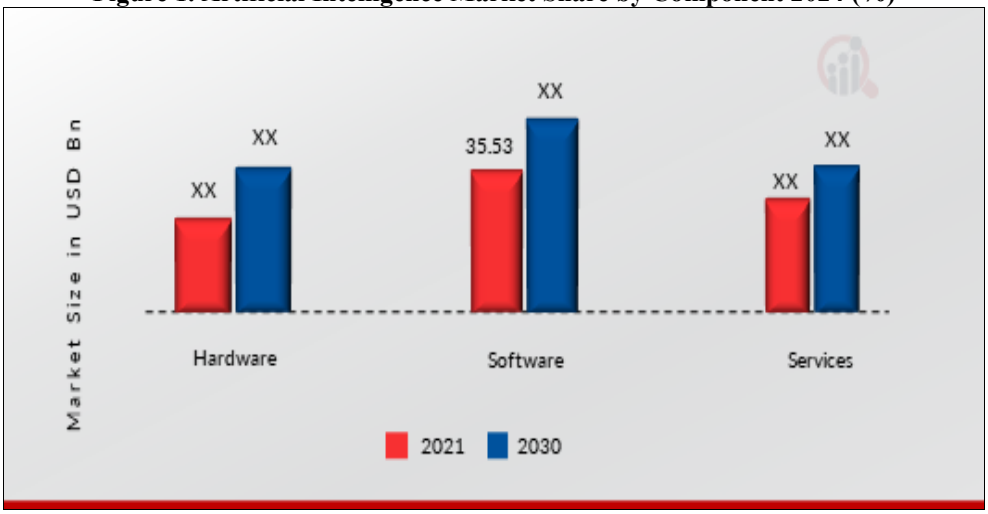
Introduction

Artificial Intelligence (AI) refers to the capability of machines to perform tasks that would normally require human intelligence. These tasks include speech recognition, decision-making, problem-solving, learning from experience, and visual perception. Looking ahead, some officials in the public sector do not dismiss the idea that AI will help solve the main strategic challenges in state administrations (Ambrusevič & Gomienė, 2024). There is also resistance to this kind of change, as some officials consider artificial intelligence a threat to their jobs (Androniceanu et al., 2020). The evolution of AI has occurred across several main components, each contributing to the development and application of this technology. The main components of AI are as follows: (1) Machine Learning (ML); (2) Deep Learning; (3) Neural Networks; (4) Natural Language Processing (NLP), which is centered on the links between machines and human language (Lazaroiu et al., 2022). Examples: Virtual assistants (e.g., Siri, Alexa), and automatic translation. (5) Robotics involves developing robots that can perform complex and autonomous tasks. For example: medical assistance robots, and manufacturing robots. (6) Expert Systems are AI systems that use human knowledge to answer questions or make decisions. For example, medical diagnostic systems, and financial decision support systems. (7) Simulations and Games use AI to simulate human behaviours or create strategies in complex games. Example: urban traffic simulation, Alfresco platforms for mobile services (Androniceanu, 2024a; Androniceanu, 2024b). In 2023, global investments in AI, including hardware, software, and services for AI-centred systems, reached 154 billion dollars, with an increase of 26.9% compared to 2022, as seen in Figure 1.

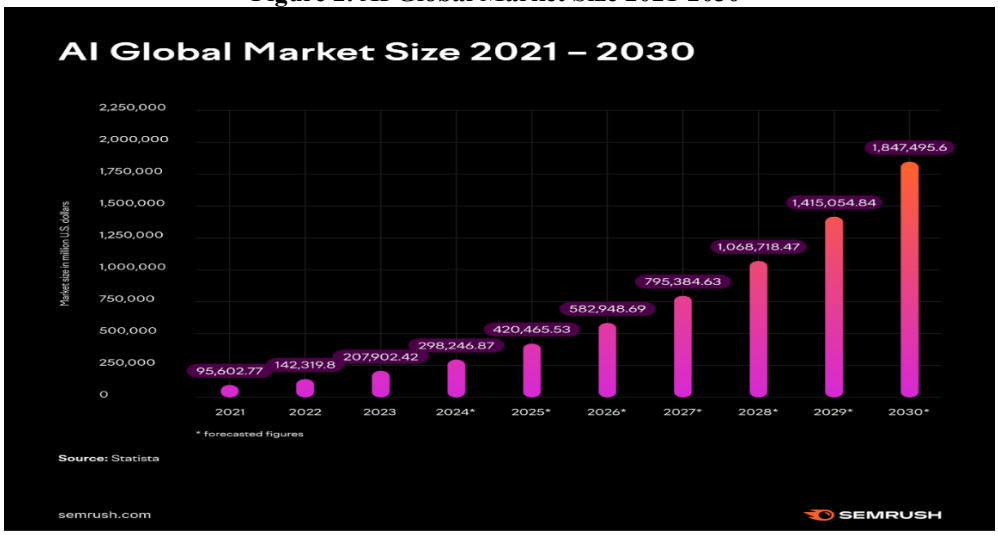
Figure 1. Artificial Intelligence Market Share by Component 2024 (%)



Source: Based on the World Bank studies, 2024

In 2026, these expenditures are estimated to exceed 300 billion dollars. Large companies are massively investing in AI applications to reduce costs. For example, Amazon spent 22.6 billion dollars on properties and equipment in just one quarter of 2023, with an increase of 81% compared to the previous year (Keerativutisest et al., 2024). The company plans to spend 75 billion dollars in 2024 and an even larger amount in 2025 to support AI investments. Other major technology companies, such as Microsoft, Meta, and Alphabet, have heavily invested in hardware to support the growing demand for generative AI. There are already several global trends outlining the rapid expansion of the AI market up to 2030, as seen in Figure 2.

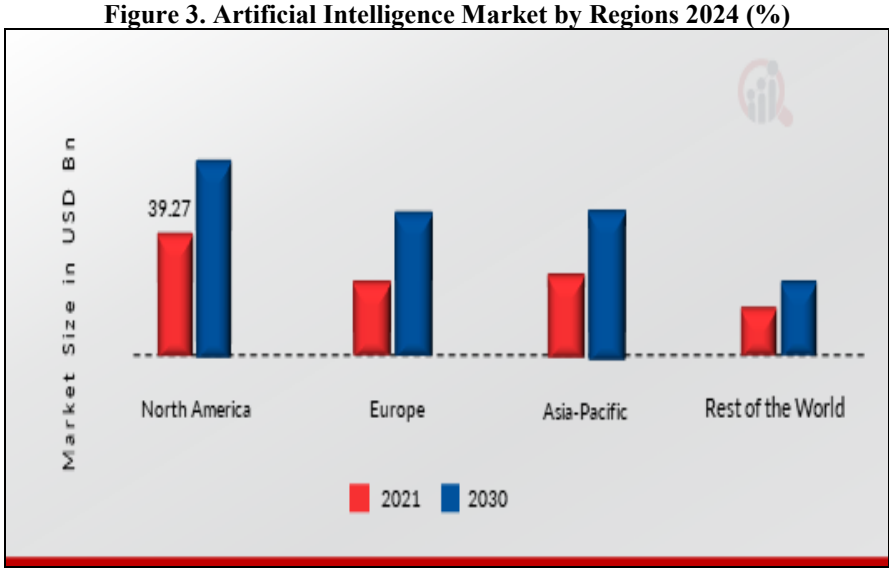
Figure 2. AI Global Market Size 2021-2030



Source: Based on the World Bank studies, 2024

According to statistics, the United States remains the main source of foreign direct investment in the AI field, with approximately 285 projects in 2022. India and the United Kingdom are the second and third largest sources of cross-border AI-related projects, with 37 and 35 projects, respectively (Al-Lafi et al., 2023; Craiut & Iancu, 2022). China is competing to capitalise on AI advantages, and the European Union does not want to be left behind. Global private investments in AI decreased by 26.7% in 2022 compared to 2021, due to concerns from lawmakers and publications about this technology (Doanh et al., 2023; Dvorsky et al., 2023). The increasing availability of data: the amount of data generated globally is continuously growing. This data is the fuel for AI, allowing algorithms to learn and improve. A Forbes study (Implement Consulting Group, 2024; Mehr, 2017) shows that over half of business owners are already using AI for cybersecurity and fraud management, while 53% of companies use AI to improve production processes, and 51% use it for task automation. The differences in AI investments at the international level are visible across regions, both currently and in perspective until 2030, as shown in Figure 3.

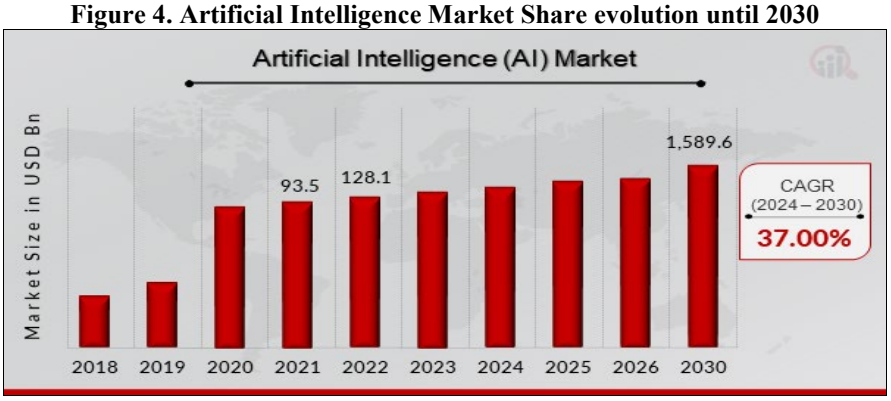
Figure 3. Artificial Intelligence Market by Regions 2024 (%)



Source: Based on the World Bank studies, 2024

Investments in software for artificial intelligence (AI) have seen significant growth in recent years, reflecting the increased interest of companies and investors. These investments underline the importance and significant potential of AI in transforming various fields and economies globally, as seen in Figure 4.

Figure 4. Artificial Intelligence Market Share evolution until 2030



Source: OECD, 2024

The global artificial intelligence market is booming. More and more companies are realising the potential of this technology to improve operations, increase productivity, and create new business opportunities. In the future, as more resources are allocated and new digital competencies are developed in all areas of the public and private sectors, AI can become a central pillar of the economic and administrative modernisation of states (Sun at al. 2022a; Sun et al., 2022b).

1. Literature review about the main benefits of integrating AI in public administration

AI plays an increasingly important role in numerous administrations in European states to support public officials, contributing to the efficiency and quality of services offered. Here are some ways AI is used in this context: (1) Automation of administrative processes; (2) Data analysis; (3) Virtual assistance based on Chatbots (4) Performance monitoring: AI allows continuous monitoring of public services' performance and identifying points for improvement, thus contributing to their optimisation. (5) Service personalisation: AI can personalise services for citizens, ensuring that each municipality has access to relevant information and personalised solutions. Some of the most important benefits are as follows: (1) Efficiency and speed, meaning that AI automates repetitive tasks, reduces bureaucracy, and processing time, providing quick responses to citizens (Korzynski et al., 2023 a, b). For example, chatbots can handle frequently asked questions and simple requests, freeing public officials from these tasks (Fichter & Anguelov, 2024). (2) Accuracy and error reduction can be achieved with AI algorithms that can perform complex calculations and analyses without errors, ensuring that data is processed correctly (Aoki, 2020). For example, AI-based document management systems can automatically identify and correct errors. (3) Improving service quality, as AI solutions can identify recurring problems and offer improvement suggestions, ensuring a better quality of public services. (4) Service personalisation achieved with AI allows services to be personalised based on data collected about citizens' needs and preferences. (5) Decision-making efficiency; (6) Transparency and accountability. For example, public project tracking systems can use AI to provide detailed and up-to-date reports on progress and resource usage (Krajčík et al., 2023). The demand for generative AI has exploded since the launch of ChatGPT by OpenAI, prompting companies to invest in hardware to meet these needs. Building data centres and purchasing the necessary equipment for AI involves significant costs, which can affect organisations' budgets. These investments underline the importance and significant potential of AI in transforming various fields and economies globally. AI is transforming how public administrations operate, creating opportunities for more efficient, accurate, and citizen-centred services (Androniceanu, 2024a; Androniceanu, 2024b). In conclusion, using AI in public service, in government administration offices, and in the academic environment is an opportunity with advantages and risks. It is essential to understand that the transition must be approached carefully and responsibly, ensuring that the benefits brought by AI are maximised, and the risks are efficiently managed to create a more efficient and equitable future.

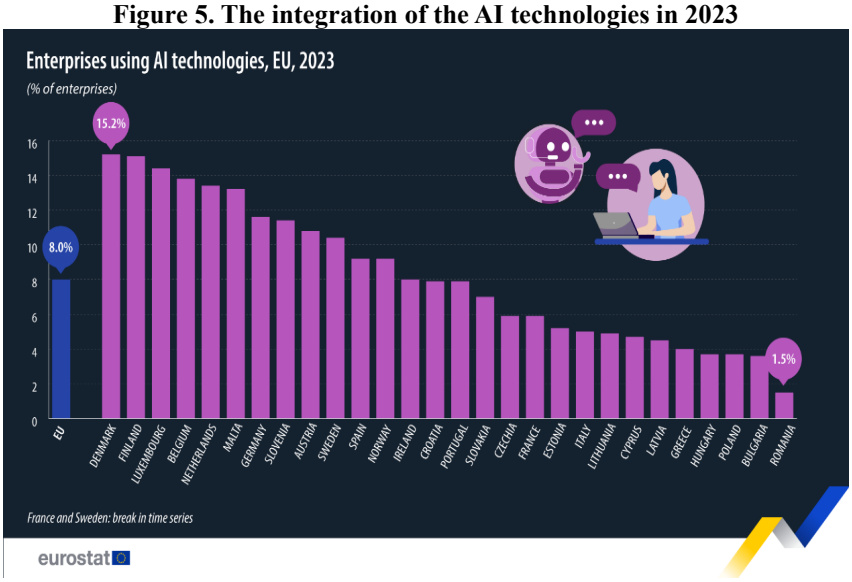
2. Artificial Intelligence in the public administrations of the European states

The European Union (EU) has outlined a strategy regarding AI, focusing on its implementation in public administration. For example, in Sweden, the use of AI to optimise water resource management and to predict and prevent floods already has a major positive impact on public spending. The French public administration uses AI to improve traffic planning and efficiently manage emergency services. The German government is implementing AI to automate administrative processes and support data-based policy decisions. The Italian public administration uses AI to personalise services for citizens and improve cybersecurity (Zsigmond & Mura, 2023). For example, in the UK public health sector, the NHS (National Health Service) uses AI to improve patient diagnosis and treatment, as well as to optimise resource management (Zsigmond et al., 2024). In justice, the Ministry of Justice has implemented AI to automate legal processes and improve administrative efficiency. In public transportation, local authorities use AI to manage traffic and improve infrastructure planning (Ansell & Gash, 2008). Social Services in the United Kingdom use AI to identify and support vulnerable individuals and optimise the distribution of social resources. Identifying and supporting vulnerable individuals in the UK is achieved with AI applications that analyse demographic and social data, identifying individuals who need social assistance and providing them with the necessary support. Optimising the distribution of available resources in the UK is done with AI algorithms that help efficiently manage resources, ensuring that they are distributed equitably and reach those who need them most. Automating administrative processes is a constant concern of public administration in the UK. Thus, AI is used to automate administrative processes, reducing waiting times for citizens requesting social services and improving the system's overall efficiency. For monitoring and evaluating performance in the UK, AI allows continuous monitoring of social services performance and identifying points for improvement, thus contributing to their optimisation. Automating administrative processes with the help of AI reduces human errors and increases operational accuracy. Finland, for example, tested a bot called Aurora to help citizens find a job and graduates choose a career based on their interests and skills. Its algorithm claims to anticipate when skills become outdated and then suggests a more sustainable employment path or recommends available training (Folgado-Fernández et al., 2023; Gladden et al., 2022; Streimikiene, 2023). According to some surveys, the most popular AI application in the public sector is image analysis, chosen by 41% of respondents (Stoyanova & Angelova, 2024; Svobodova et al., 2024).

3. Challenges and benefits of implementing AI in the Romanian public administration

Integrating artificial intelligence (AI) into public administration in Romania has enormous potential to transform how institutions interact with citizens and conduct their internal activities. Although many challenges remain, progress is evident, and the long-term benefits of AI are promising. In Figure 5 can be seen the position of Romania based on AI integration, calculated by the European Commission in 2023.

Figure 5. The integration of the AI technologies in 2023



Source: European Commission, 2023a

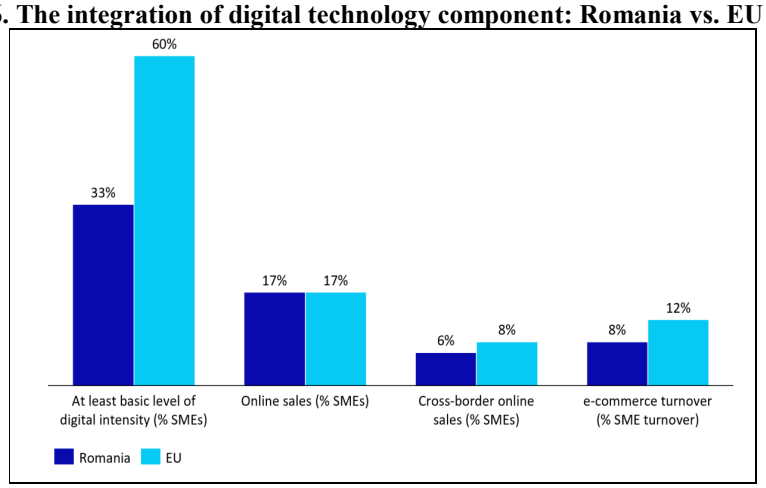
According to the report Digitalisation in Europe - 2024 Edition, published by Eurostat, only 8% of organisations in the EU used AI technologies (Ziemba et al., 2024). Romania recorded the lowest adoption rate, with only 1.5% of companies using AI. Geographically, Denmark and Finland are in the lead (15%), followed by Luxembourg and Belgium (14%), while Romania is at the bottom (>2%), alongside Bulgaria, Poland, Hungary, and Greece (all 4%). The low adoption of AI in Romania is likely caused by several factors, including a lack of awareness of the benefits of this technology, limited access to resources and expertise, and an uncertain regulatory framework. Recognising the importance of AI for economic competitiveness, the European Union recently enacted the Artificial Intelligence Act (Mugunzva & Manchidi, 2024). This law establishes a regulatory framework for developing and using AI in the EU, to promote innovation, protect fundamental rights, and ensure public safety (Machova et al., 2023). Nevertheless, Romania has a National AI Strategy for the period 2024-2027, which includes objectives such as supporting education for digital and AI skills, developing infrastructure and datasets,

and facilitating AI adoption across society (Wojciechowski & Korjonen-Kuusipuro, 2023; Głodowska et al., 2023). AI investments in Romania reached a record level of 230 million dollars in 2022. Direct investments were made in companies active in the AI field, such as Nvidia, Intuitive Surgical, and Upstart. ETFs are other investments in exchange-traded funds focused on technology and AI organizations.

4. Implementation of AI in the public and private sector in Romania

Investments in research and development of artificial intelligence have increased in recent years, leading to the creation of new technologies and applications in this field. In 2023, the total value of investments in Romanian startups reached EUR 129.6 million, representing an increase of 27.4% compared to the previous year. FlowX.AI received EUR 35 million, DRUID - EUR 30 million, and Creatopy - EUR 10 million. By 2027, 20.5% of PNRR funds, amounting to over EUR 5 billion, will be invested in developing digital infrastructure and introducing AI systems in both public and private services. Romania has developed a national AI strategy for 2024-2027, which includes priorities and policies for developing these technologies. These investments highlight the significant importance and potential of AI in transforming various fields and economies at the national level. The investments in AI hardware in Romania have seen significant growth in recent years, reflecting the increasing interest of investors and companies. Among the general objectives are the development of infrastructure and datasets necessary for AI. Within the National Strategy, investments will be made in the necessary infrastructure for AI, including data centres and sophisticated equipment. However, the significant gap between Romania and other European Union member states in adopting AI reflects not only a lack of infrastructure and expertise but also a complex set of structural and cultural issues. A comparison image can be seen in Figure 6.

Figure 6. The integration of digital technology component: Romania vs. EU average



Source: European Commission, 2023b

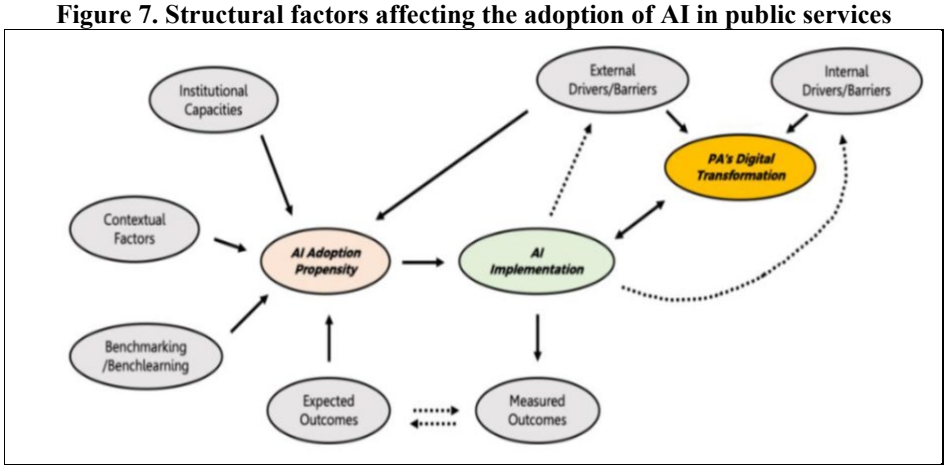
Romania collaborates with international companies and educational institutions to develop and implement AI technologies. These investments underline the importance and significant potential of AI in transforming various fields and economies at the national level. Investments in AI services in Romania have seen significant growth in recent years, reflecting the increasing interest of investors and companies.

While the EU adopts legislation and invests in AI research and development, Romania faces challenges related to education, regulation, and digital infrastructure. As Romania aims to bridge this gap, it is essential to know and address the main challenges in an integrated and strategically well-planned manner. The main challenges for AI growth in Romania are as follows:

1. Lack of digital infrastructure and financial resources: Many public institutions in Romania lack the necessary infrastructure to implement AI on a large scale. Investments are often limited by insufficient budgets or priorities that do not include digitalisation.
2. Deficit of digital skills: AI requires advanced technical knowledge, which public sector personnel do not always have. Therefore, it becomes essential to invest in training public officials to facilitate the transition to AI usage.
3. Privacy and security concerns: As AI becomes more involved in public activities, the need to protect citizens' data increases. A clear and robust regulatory framework is necessary to ensure privacy protection and prevent abuses.
4. Transparency and public acceptability: Implementing AI in public administration may raise scepticism among citizens who fear job losses or perceive automated decisions as unfair. To gain public trust, ensuring process transparency and providing clear explanations of how AI works and its benefits is essential.

According to the EU research and studies, there are several structural factors influencing AI adoption, as can be seen in Figure 7.

Figure 7. Structural factors affecting the adoption of AI in public services



Source: European Commission, 2023b

Investments in education and professional training, creating a business environment favourable to innovation and developing digital infrastructure are a few important issues needed to stimulate AI adoption and leverage its transformative potential. The European Union relies on the positive impact of AI and will invest in AI research and development, offering organisations opportunities to obtain funding for innovative projects and supporting professional training programs, thereby encouraging them to develop the necessary resources to adopt artificial intelligence. Here are some examples of AI integration in public administration in Romania:

1. Automating administrative processes to reduce repetitive tasks, reducing costs and the time needed to complete these tasks.
2. Big data analysis: Public administration uses AI to analyse large data sets, aiding in informed decision-making and trend identification.
3. Personalised services: AI enables the customisation of public services to meet individual citizens' needs.
4. Security and fraud prevention: AI technologies are used to detect and prevent fraud in various public administration areas.
5. User interaction: AI-based chatbots and virtual assistants are implemented to provide efficient support and information to citizens.
6. Emergency services: AI helps in the rapid analysis of data to allocate appropriate resources in emergencies.
7. Public health: AI algorithms help monitor and prevent disease spread by analysing epidemiological data.
8. Social protection: AI is used to identify and support vulnerable groups by analysing demographic and social data.
9. Administrative services.

Partnerships between research organisations from public and private sector and public administration can be an effective successful option. There is a real need for improving cooperation between such partners, at the European level as well, as it can be seen in Figure 8.

Figure 8. Evolution of digitalisation in Romania

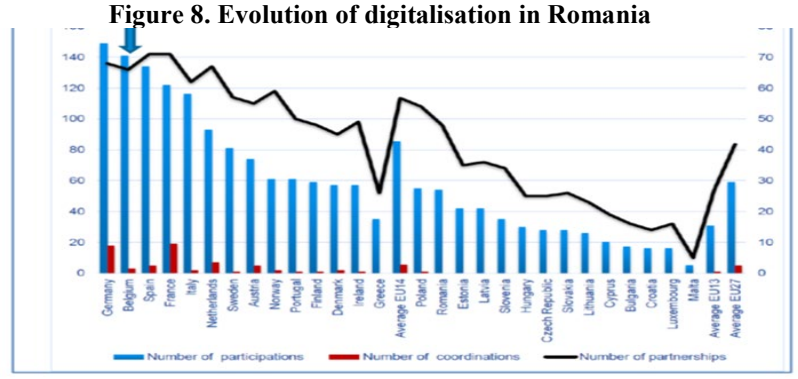


Figure 30 Participations and coordination of partnerships by country and number of partnerships by country in Horizon 2020 – EU27 – situation April 2020

Source: ERA-LEARN (2020)

Source: European Commission, 2023b

According to the results of a study conducted by the Scandinavian consulting company Implement Consulting Group (2024), in Romania, just under a third (31%) of the officials who participated in the survey stated that AI is very important for solving some of the current challenges of public administration. Another 64% said that it is somewhat important (Sieja & Wach, 2023; Ślusarczyk & Wiśniewska, 2024).

Generative AI can streamline administration through personalised solutions for citizens, reduced processing times, and providing data-driven rapid strategic decisions (Wach et al., 2023). Although 54% of public administration employees use AI, this use is often for individual rather than institutional benefit (Orzynski et al., 2023). The main obstacles mentioned are lack of skills, cost of tools, and security concerns. In Romania, some AI applications have been implemented (Pechová et al., 2024). For example, automating administrative processes through AI is an expanding field in Romania, aimed at improving the efficiency and productivity of public institutions. Here are some examples of projects through which this has been achieved:

1. The Process Automation Project (RPA) managed by the Romanian Digitalisation Authority (ADR) implemented the project Automation of work processes in public administration funded through the National Recovery and Resilience Plan (PNRR). This project aims to standardise processes, reduce errors, and processing time for citizen requests.
2. The use of chatbots for responding to frequently asked questions from citizens, directing requests to the appropriate departments, and completing online forms.
3. Data Analysis and Forecasting, where AI is used to analyse large volumes of public data, allowing institutions to make predictions and identify trends that can support better-informed public policies oriented towards citizens' needs.
4. Cybersecurity, where AI helps detect and prevent cyberattacks by identifying unusual behaviours and promptly alerting potential security breaches.

These examples illustrate how AI can contribute to improving the efficiency and quality of public services in Romania.

5. Conclusions

Perspectives on the use of artificial intelligence (AI) in state administrations are varied and complex, reflecting both the opportunities and challenges associated with this technology. As shown in the case analysis underlying this work, AI creates new opportunities for public administration, such as: improving the efficiency and productivity of public services through the automation of administrative processes and reducing bureaucracy; optimising decision-making based on real-time data analysis; and providing personalised services for citizens.

The most significant challenges of AI are related to transparency and accountability, ethical issues due to concerns about data protection and the possibility of excluding certain groups of citizens from the benefits of technology. The third significant challenge is related to costs and resources, as the development and implementation

of AI solutions require significant investments and advanced technological resources. Another particularly important aspect resulting from the analysis is the need to develop regulations and standards to govern the use of AI in public administration and ensure compliance with existing laws.

Conflict of Interest Statement

The author declares that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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