

Digital Transformation of Public Administration Services: Lessons for Romania

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Abstract. *The digital economy has fundamentally redefined the operation of public institutions, necessitating urgent strategic restructuring to enhance efficiency and optimize the services offered to citizens. This study, which utilizes a comparative analysis based on the Digital Economy and Society Index (DESI), examines the digitization of public administration in Romania in relation to other EU member states. A bibliometric analysis of the relevant literature was conducted, identifying the most influential scientific contributions in the field and a comparative evaluation of the leading DESI indicators for 2023 and 2024. The study uncovers the primary barriers to adopting digital technologies in Romanian public administration, such as resistance to change, limited digital skills, and reduced allocation of financial resources. However, the results also underscore the urgent need for action. Strategic directions are proposed to accelerate the digital transformation, including measures to increase digital skills, improve decision-making processes, and strengthen the legislative framework. These proposed directions not only address the current challenges but also emphasize the need for immediate action to ensure a more efficient, transparent, and accessible public administration in the future.*

Keywords: digitalization, public administration, digital public services, emerging technologies, digital transformation, digital economy and society index (DESI).

Introduction

Digital transformation is essential for the evolution of public administration and increasing the efficiency of government institutions (Cazan, 2022). The European Union has established clear objectives for digitization through the Digital Compass strategy, encouraging member states to invest massively in IT infrastructure (Mihai et al., 2022). Although it has progressed, Romania faces significant challenges in implementing e-government strategies (Anghel-Drugarin, 2022).

The present study analyzes the position of Romania compared to other European states and identifies solutions for reducing digital gaps.

Integrating digital transformation and artificial intelligence (AI) into public administration is a significant challenge, but the experience of many countries has shown the substantial positive impacts of both perceived usefulness and perceived impact on managers' attitudes and behavioural intentions towards AI adoption (Majrashi, 2024). New emerging technologies, such as collaborative artificial intelligence, sensory enhancement, augmented reality and blockchain, present significant opportunities for modernizing public administration (Berryhill et al., 2018). The digitalization of public administration has given rise to e-government and digital government (Todorovski & Vintar, 2021). Extensive studies from various fields highlight the impact of information and communication technologies (ICT) on administrative practices and socioeconomic development (Barcevičius et al., 2019). At the same time, artificial intelligence plays an increasingly significant role in public administration, optimizing various administrative functions and generating significant improvements in multiple fields (Ahn & Chen, 2020; Wirtz et al., 2019). These technologies are gradually being integrated into public institutions and are contributing to the efficiency of processes by reducing bureaucracy and increasing the accessibility of public services (Lazaroiu et al., 2022). The positive impact of these initiatives on administrative efficiency is a reason for optimism, as they are improving the interaction between public institutions and citizens (Koman et al., 2022).

The specialized literature defines the digitalization of public administration as a set of technological and organizational processes for facilitating access to services and information (Androniceanu & Georgescu, 2023). The concept of e-government has an important position in this transformation, involving the use of the Internet and digital platforms to improve relations between administration, citizens and the business environment (Janssen & Estevez, 2013). For example, AI can automate repetitive tasks, freeing up civil servants' time and allowing them to focus on strategic and value-creating activities. Studies such as (Scholl, 2022; Xanthopoulou & Plimakis, 2021) present examples of good practices adopted at the level of European Union countries, but there is not enough research on the status and concrete measures to boost the digitization of administrative services in Romania. Our article aims to contribute to filling this gap by providing the results of a comparative study, at the level of the last 2 years of the values of three key specific indicators and some recommendations aimed at a possible acceleration of the digitalization of the Romanian public administration. The importance of these findings cannot be overstated, as they provide valuable insights and recommendations for the future of public administration in Romania. The research methodology included a systematic literature review complemented by a detailed bibliometric analysis of the publications indexed in the Scopus database. For this purpose, the data were extracted using a search strategy, including relevant terms from the digitalization of public administration area. The resulting data set was processed and analyzed using the VOSviewer software, allowing the visualization of bibliometric relationships between authors, institutions, countries, and the main research themes. Furthermore, the article was structured as follows: in section 2, some of the literature review results are presented, and in section 3, the research methodology used. Section 4 is dedicated to presenting the findings and discussion, and in section 5, the challenges and recommendations elaborated to accelerate digitalization are shown. The article ends with relevant conclusions of the present research while highlighting the existing limits and future research directions.

Literature review

The specialized literature defines the digitization of public administration as implementing ICT technologies to increase the efficiency of institutions and facilitate interaction with citizens (Janssen & Estevez, 2013). The relevant theoretical models include: i) *Technology Acceptance Model* (TAM) – analyzes the human factors (perceived usefulness and ease of use) that influence the adoption of digital technologies; ii) *Technology Adoption Model* (e-government adoption) – analyzes the technical, organizational, political and legislative factors that impact the adoption of digital technologies; iii) *Theory of Diffusion of Innovation* (DOI) – explains how technologies spread in society; and iv) *Digital Maturity Model* – evaluates the degree of digitalization of an organization or a state.

Although the existing literature provides a valuable framework for understanding the impact of digital technologies on public entities, there are still many opportunities for research. There is little detailed research (Wilson & Mergel, 2022; Tangi et al., 2021; Eom & Lee, 2022) on the need for digital skills training of public officials, resistance to change, and financial and political constraints. These insufficiently treated topics provide opportunities for research such as the present study, which aims to identify the key factors that influence the adoption of technologies and formulate some strategic recommendations, contributing to a deeper understanding of the benefits of adopting emerging technologies in public administration. International studies show that countries such as Estonia, Denmark and Germany have been successful due to coherent digitization strategies and continuous investments in IT infrastructure (Scupola, 2018; Mattes & Bertermann, 2021; Solvak & Lauringson, 2024). Thanks to a coherent national strategy, after gaining independence in 1991, Estonia invested in IT and digital infrastructure. Starting from the challenge of prioritizing the development of computer skills in schools, in 1996 Estonia launched the Tiger Leap initiative, a program to develop the population's skills in using the Internet (Kattel & Mergel, 2019). In 2002, Estonia launched the Digital Identity (e-Identity) program through which every Estonian citizen and resident has an electronic identity (eID), which allows them to interact with the state and use all its services (Abaku et al., 2022). This includes paying bills, voting online, signing contracts and accessing medical information. The challenge was identifying residents who use public and private services safely, and the effect was that 98% of the Estonian population had an ID card. Digital signatures are estimated to save 2% of GDP annually by eliminating paper and related logistics, reducing administrative staff, and reducing corruption and possible fraud. In 2005, to maximize accessibility to local and general elections, Electronic Voting (i-Voting) was launched, the effect being that currently a third of votes in elections are cast online, with votes cast from over 110 countries (Espinosa & Pino, 2024).

Since the unprecedented cyber attack in April 2007, Estonia has been at the forefront of cyber security development, implementing measures to mitigate the effects of such attacks. Notably, the country is home to the headquarters of the NATO Cooperative Cyber Defense Center of Excellence and the EU IT Agency, both located in Tallinn (Štrucl, 2021). This proactive approach underscores Estonia's commitment to cyber security and its role as a leader in the field.

Estonia has also been a trailblazer in the adoption of blockchain technology, leveraging it to counter data manipulation threats following cybernetic attacks. The KSI blockchain supports several government ledgers, including electronic health records that provide comprehensive patient profiles, reduce bureaucracy, and ensure access to critical information in emergencies; the system is fully digitalized (Adeniyi et al., 2024). In 2014, Estonia made history by becoming the first country to offer e-residency to individuals from outside its borders, granting them access to

Estonian digital services and the ability to establish companies in Estonia without physical presence.

Starting from the challenge of ensuring a digital continuity of the state in worst-case scenarios, such as critical system failures or external threats, Estonia is the first country where critical databases and services are supported in a high-security data centre in Luxembourg (Rice, 2021).

Denmark, known for one of the most advanced digital strategies in the world, sets the course for digitalization efforts through a centralized and well-coordinated approach (Scupola, 2018). According to international statistics, Denmark has one of the most digitalized public sectors globally. Its centralized electronic identification system (NemID) and robust digital infrastructure enable citizens to access public and private services quickly and securely. The national digitalization strategy for 2022-2026 underlines the country's continued commitment to innovate and develop new technological solutions for public administration (Falch & Henten, 2000).

Germany has developed AI-based solutions for various areas of public administration, including national defense (Lemke et al., 2024). Pilot projects in this sector have demonstrated that AI can improve decision-making processes, data analysis and resource management. Although implementation is slower due to the complex federal structure, Germany is investing heavily in training civil servants and developing a solid technological infrastructure.

Methodology

In order to better observe the digitalization in EU countries, the research methodology mainly included a systematic review of the literature, complemented by a detailed bibliometric analysis of the publications indexed in the Scopus database. For this purpose, the data were extracted using a specific search strategy, including relevant terms for the digitalization of public administration. The resulting data set, containing 828 publications from the period 1985-2025, was refined by excluding publications from the period 1985-2018, following which 784 scientific works were identified that were processed and analyzed using the VOSviewer software, allowing the visualization of bibliometric relationships between authors, institutions, countries and the main research themes.

The co-citation and co-occurrence analysis of keywords (Figure 1) highlighted the main research directions in the field. The most frequently used concepts addressed were "digitalization", "public administration" and "e-government", indicating a focus on digital technologies used in administration. In addition, 5 major thematic clusters were identified, reflecting the predominant topics covered in the specialized literature. Thus, the red cluster is based on key concepts such as public administration, digitalization and digital economy and their impact on the economy and public services. The green cluster, formed around e-government and digital governance, explores the implementation of digital solutions in public administration. The blue cluster is based on scientific research specific to emerging technologies used in the public sector. The orange cluster includes terms such as e-learning, organizational change and strategic economics and analyzes how the human resource in the public administrative sector adapts to the changes generated by digitalization.

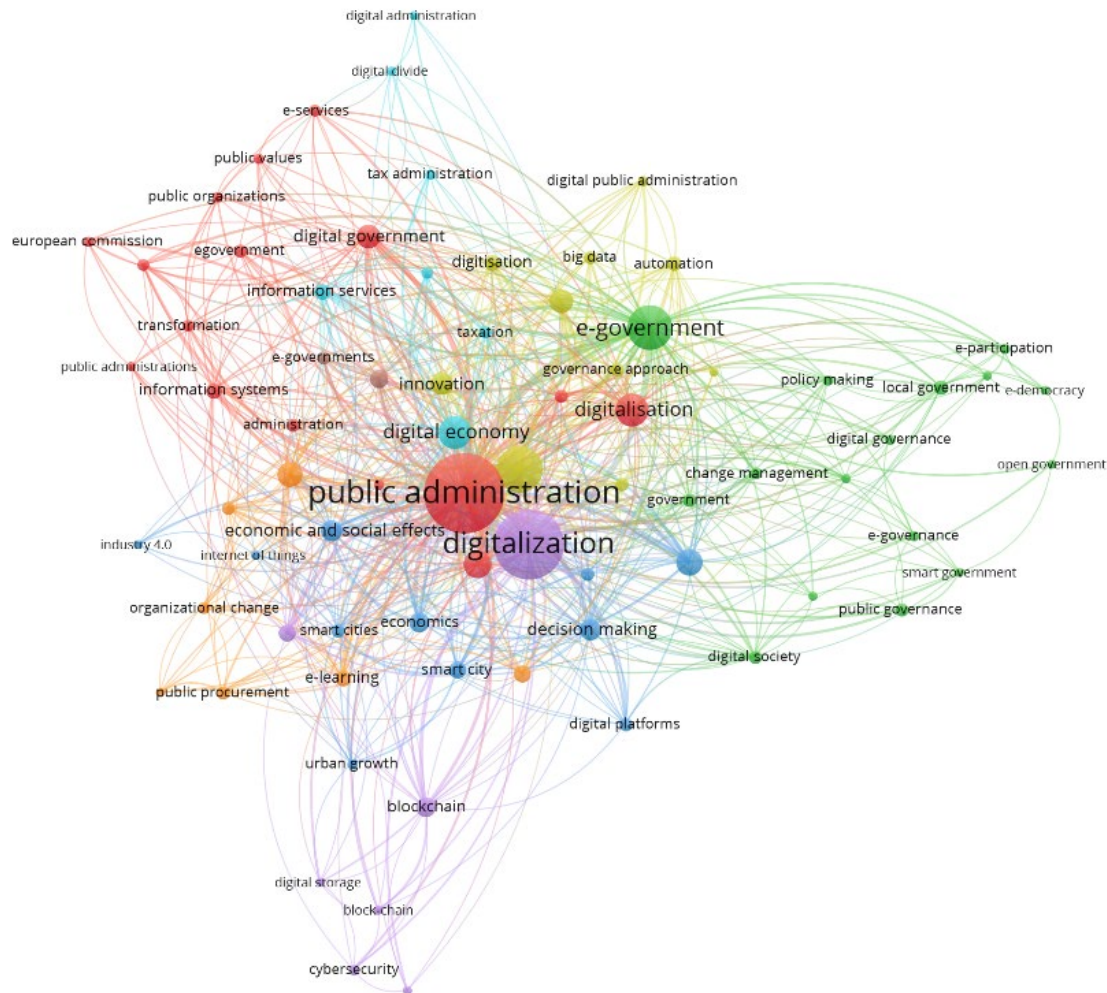


Figure 1. Keyword co-citation and co-occurrence analysis

Source: own processing in VOSviewer.

The analysis of collaboration between authors and institutions showed that the Russian Presidential Academy of National Economy and Public Administration is a main contributor in the field, having the largest number of papers (31) and connections in the academic network with countries such as the United Kingdom, Germany, Turkey and Poland. Besides Russia, the most influential countries in terms of publications are Italy, Germany and Ukraine, and the analysis of the collaboration network highlighted strong partnerships between institutions in Italy, Germany and the USA, but also Italy and United Kingdom (Figure 2).

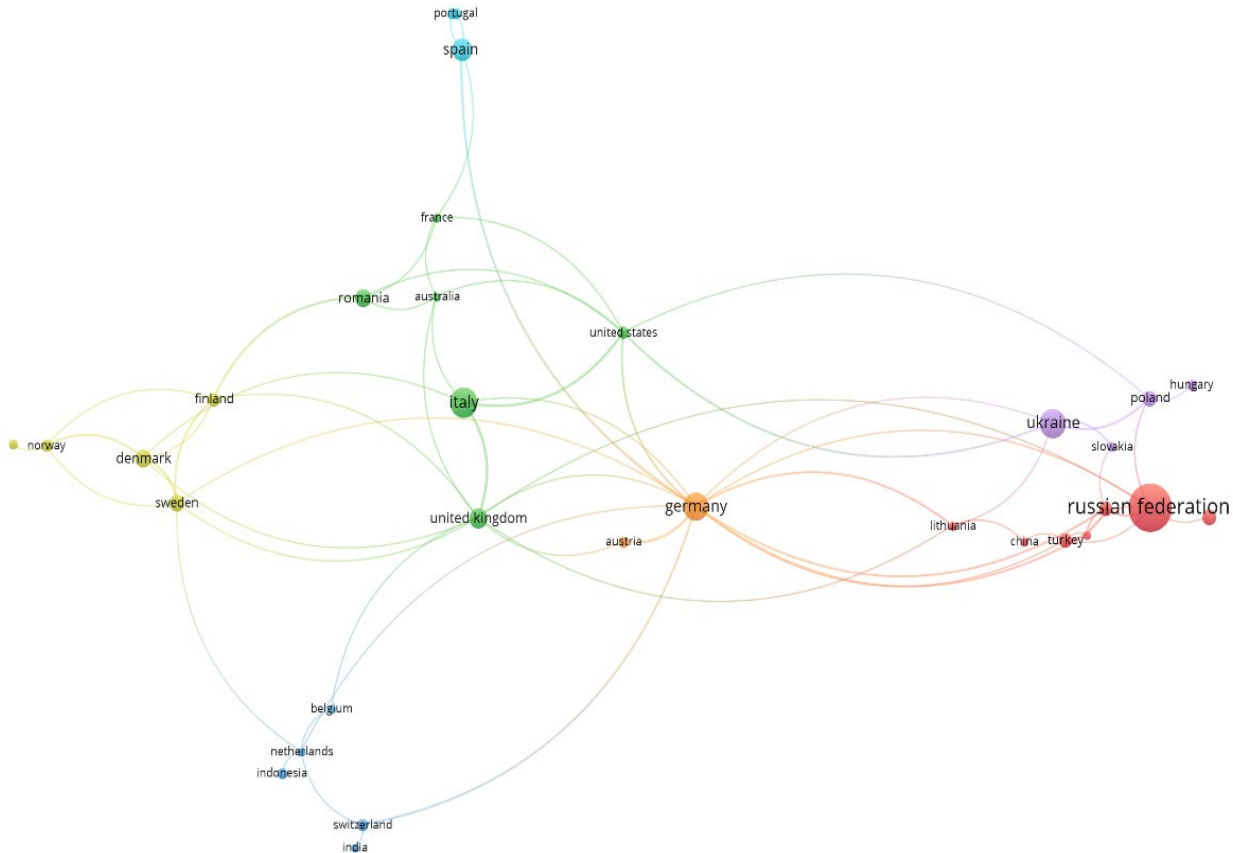


Figure 1. Co-authors analysis

Source: own processing in VOSviewer.

Analyzing the citation networks, the articles of the most influential scientific works, with a high number of references in the specialized literature, were identified. Among them, the work "Digital by default - A qualitative study of exclusion in digitalised welfare", authors Schou J. and Pors A. stood out for its significant impact on the theoretical and practical development of digitalization among social assistance services on citizens, especially on the disadvantaged (Schou & Pors, 2019).

The results of the bibliometric analysis highlighted not only the major research directions on the digitalization of public administration, but also the real impact of these transformations on citizens, especially on the vulnerable ones. In this context, a complementary approach to understanding the level of digitalization at the level of European public administration is the analysis of the Digital Economy and Society Index (DESI), a tool used by the European Commission to measure the progress of Member States in the field of digital transformation. This methodological transition, from the analysis of citation networks to the comparative evaluation of DESI indicators, allows for a broader contextualization of the identified theoretical conclusions, correlating the trends in the specialized literature with the concrete performances of the Member States of the European Union. Therefore, the examination of the structure and results of the DESI indicator offers an objective perspective on the degree of digitalization of public administration in Europe, highlighting the relevant lessons for Romania in this process.

Comparative analysis of the digitalization of public administration. Findings and discussions

The structure of the DESI indicator is composed of five main dimensions, each with different weights: Connectivity (25%) – covers fixed and mobile internet infrastructure, access to high-speed broadband, etc., Human capital (25%) – includes basic and advanced digital skills, IT&C specialists, Internet use (15%) – measures how much citizens use digital services (banking, e-commerce, social media, etc.), Integration of digital technology in business (20%) – analyzes the digitization of SMEs, the use of AI, Big Data, cloud computing, Digital Public Services (15%) – e-government, online services for citizens and businesses, electronic health records. The indicators are normalized on a scale from 0 to 100 (where 100 is the best performance), specific weights are applied to each indicator, a score is calculated for each dimension, then a final aggregate score is calculated for each country and the weighted average is applied for each dimension (European Commission, 2024).

Harnessing the official data available (European Commission, 2024), we developed Table 1 to centralize and compare the values reported for the years 2023 and 2024, based on data collected in 2022 and 2023. This reference period is particularly relevant in the analysis of the digitalization process, as it marks the transition to post-pandemic normality, reflecting the impact of accelerating investments in technology and digitalization. At the same time, the rapid development of digital technologies has generated significant progress in artificial intelligence, process automation and massive data analysis (Big Data), in parallel with global economic and social changes.

In addition, the selection of the three main indicators – Digital Public Services, Pre-Filled Forms and Access to electronic files – is based on their relevance to the digitalization of public administration. These factors are essential for reducing bureaucracy, optimizing costs and increasing accessibility and transparency in the provision of digital public services, thus contributing to the efficiency of the interaction between administration and citizens.

Table 1. Comparative analysis of 3 relevant indicators of the digitalization of public administration services in the European Union, for the years 2023 and 2024 (data recorded in 2022 and 2023, respectively)

Country	Digital Public Services 2023 [%]	Digital Public Services 2024 [%]	Pre-Filled Forms 2023 [%]	Pre-Filled Forms 2024 [%]	Access to electronic files 2023 [%]	Access to electronic files 2024 [%]
Austria	78.42	80.71	71.2	66.48	88.16	88.16
Belgium	81.45	82.33	77.16	75.08	85.06	100
Bulgaria	59.51	67.47	63.75	71.08	77.2	77.2
Cyprus	63.62	73.95	48.95	59.37	70.22	68.14
The Czech Republic	76.16	76.33	41.94	45.09	46.6	51.05
Germany	78.44	75.83	43.3	40.8	70.29	86.95
Denmark	84.04	84.23	87.3	91	95.83	97.91
Estonia	94.03	95.83	87.5	88.05	89.16	97.5
Greece	64.59	75.91	54.38	79.01	60.71	73.8
Spain	86.18	84.18	82.79	80.72	83.14	84.58

Country	Digital Public Services 2023 [%]	Digital Public Services 2024 [%]	Pre-Filled Forms 2023 [%]	Pre-Filled Forms 2024 [%]	Access to electronic files 2023 [%]	Access to electronic files 2024 [%]
European Union	77.03	79.44	67.55	70.81	71.54	79.11
Finland	91.61	90.6	89.81	87.59	90.05	82.61
France	71.29	72.09	47.31	62.77	54.49	79.27
Croatia	71.11	67.17	38.33	49.37	85.56	85.56
Hungary	67.87	73.36	60	71.11	79.91	85.98
Ireland	81.07	81.2	61.29	62.84	0	11.36
Italy	67.9	68.27	47.11	47.9	71.32	82.68
Lithuania	83.84	86.7	93.41	92.3	91.95	95.41
Luxembourg	94.77	94.77	71.85	69.62	67.16	76.09
Latvia	87.17	88.22	76.26	79.04	78.83	84.81
Malta	100	100	88.41	93.96	77.61	88.03
Netherlands	84.62	85.86	94.01	89.01	69.37	72.47
Poland	59.91	63.73	78.29	79.94	86.4	90.02
Portugal	77.83	81.54	81.48	79.89	62.68	85.98
Romania	47.58	52.18	40.74	39.58	57.06	58.57
Sweden	88.16	93.27	86.29	83.11	70.29	77.93
Slovenia	71.35	77	72.03	73.88	80.41	87.55
Slovakia	67.23	72.05	55.86	53.33	42.03	66.34

Source: <https://digital-strategy.ec.europa.eu/en/policies/desi>.

The interpretation of our outcomes is structured and presented in the following subsections.

Digitalization of public services

The comparative analysis of the indicator values, recorded in the years 2023 and 2024, describes the fact that Romania is approximately 25-30 percentage points below the EU average and much below the top countries, such as Estonia and Denmark. It is obvious that Romania has a lot to recover in terms of the digitization of public services. Romania has a value of 47.58% in 2023 and 52.18% in 2024, which is well below the European Union average, which stands at 77.03% in 2023 and 79.44% in 2024. Estonia is at a very high level, with scores of 94.03% in 2023 and 95.83% in 2024. Denmark and Germany they are also above the EU average, with scores of 84.04% (2023) and 75.83% (2024) for Germany and 84.04% (2023) and 84.23% (2024) for Denmark.

Pre-filled forms

Romania is significantly below the EU average and behind the top countries, with a gap of approximately 27-31 percentage points compared to the European Union average and 46-50 points compared to Estonia and Denmark. Romania's performance in this category is much lower compared to the EU leaders, indicating a limited adoption of pre-filled forms in the public administration. Romania has a score of 40.74% in 2023 and 39.58% in 2024, well below the European Union average of 67.55% in 2023 and 70.81% in 2024. Estonia and Denmark are at the

top with very high scores of 87.5% (2023) and 88.05% (2024) for Estonia and 87.3% (2023) and 91% (2024) for Denmark. Germany, although not achieving the same performance, is still above Romania, with scores of 43.3% (2023) and 40.8% (2024).

Access to electronic files

Romania is significantly behind the most advanced EU countries, with a difference of 31-39 percentage points compared to Estonia and Denmark, which have excellent implementations in this field. Compared to the EU average, Romania remains approximately 13-20 percentage points below the European level, which suggests a more limited access to electronic files in the Romanian public administration. Romania has a score of 57.06% in 2023 and 58.57% in 2024, below the European Union average of 71.54% in 2023 and 79.11% in 2024. Estonia and Denmark are the leaders, with scores of 89.16% (2023) and 97.5% (2024) for Estonia and 95.83% (2023) and 97.91% (2024) for Denmark. Germany has scores of 70.29% (2023) and 86.95% (2024), being closer to the EU average, but still below the top countries.

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Challenges and recommendations for accelerating digitalization in public administration in Romania

Resistance to change is one of the biggest challenges faced by public institutions in Romania. This derives mainly from the traditional organizational culture, which discourages initiative and innovation. Many employees perceive digitalization as a threat to the workplace, fearing that automated processes will lead to downsizing. This creates passive or even active resistance to new technologies (Tripton, 2014).

Another important factor is the lack of effective communication from the leaders of the institutions. Often, technological changes are implemented without involving staff in the decision-making process or without explaining their benefits (Cisneros, 2018). This contributes to a general sense of insecurity and demotivation among employees. Practical examples show that, in many cases, digitization projects encounter opposition not only from employees, but also from managers who are not convinced of the need for change (Abolade, 2018). This resistance to change can be reduced through a transparent communication process, training programs and workshops that demonstrate the advantages of digitalization.

One of the major challenges in the digitalization process is the low level of digital skills among civil servants. Most public sector employees have limited skills, being only familiar with basic applications such as the Microsoft Office suite (Bilan, 2023). More advanced technologies, such as cloud-based financial and accounting management systems or artificial intelligence applications, are often unknown. This problem is aggravated by the lack of continuous training programs and the absence of a national framework to support the development of digital skills. In many cases, employees are forced to learn on their own without technical support or adequate resources. For example, in a survey conducted among civil servants in Romania (Cibian, 2022), over 60% of the respondents stated that they had not participated in any digital training course in the last 5 years.

Insufficient budgets allocated to digitalization represent a significant obstacle in the modernization of public institutions. Short-term budget planning, influenced by election cycles, often results in a suboptimal allocation of resources to IT projects. Also, projects are frequently postponed or even canceled due to lack of stable funding (Derbeneva, 2021).

Another factor complicating the process is political influence on digitalization decisions (Drabarek, 2025). IT projects are sometimes initiated and then abandoned with the change of government or management of the respective institutions. The digitization of public administration is an inevitable and necessary process in the current context of the information society (Egorova, 2021). The implementation of modern technologies within public institutions requires that officials have adequate digital skills to efficiently manage administrative activities. Civil servants must adapt to the new digital requirements to ensure the efficiency of administrative activities, thus they must develop new skills for: i) the use of software applications: document processing, the use of databases and electronic document management systems, ii) the protection of personal and institutional data, the prevention of computer attacks, iii) the use of online platforms for the provision of public services, iv) working with artificial intelligence and data analysis through the use of algorithms and analysis tools for decision-making informed (Milakovich, 2022).

Researchers highlight that as AI agency in society expands, there is an increasing need to train public administration employees—not only in effectively communicating with AI systems but also in understanding and accepting AI-generated interactions, decisions, and recommendations (Pelau et al., 2024). The impact of AI adoption on the professional responsibilities of humans and their relationship with recipients of administrative services presents a promising avenue for future research in the field.

The digital transformation of public administration is an inevitable process that requires a strategic approach to overcome existing obstacles. Dependence on the digital skills of civil servants, resistance to change and lack of stable funding are just some of the challenges influencing the pace of digitalization. Better alignment between modernization strategies, technology investments and human resource development is essential to ensure effective implementation. The adoption of coherent policies, supported by visionary leadership and continuous training programs, can contribute significantly to the improvement of the performance of public institutions and to the creation of a digitalized administrative system, transparent and oriented to the needs of citizens.

Conclusion

The COVID-19 pandemic has determined public institutions in Romania, but also in other countries, to rapidly adopt digital solutions to ensure the continuity of the supply of essential services. Among the main measures implemented were the digitalization of tax processes through the submission of online declarations, the expansion of telemedicine services and the transition to distance education. Thus, the digitization of public administration evolved from a long-term strategic objective into an immediate necessity, imposed by the pandemic context.

At the same time, the study covers only three essential indicators (digital public services, pre-filled forms and access to electronic files). However, it does not take into account other factors that could influence digitalization, such as cybersecurity and interoperability of IT systems. A future research direction could extend the study over a longer period (2019-2025) to allow for a deeper understanding of digitalization trends and the impact of the reforms carried out, comparing Romania with countries with similar economic conditions (Poland, Hungary, Bulgaria, Czech Republic), which have gone through similar transitions, and which may provide relevant lessons for Romania.

Romania registers slow progress in the digitalization of public administration, remaining below the EU average. Accelerating digitization requires strategic reforms, sustained investments and the adaptation of lessons from successful European states in implementing digital technologies.

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