DOI: 10.47743/eufire-2023-1-16

EXPLORING THE CHALLENGES AND OPPORTUNITIES OF IMPLEMENTING A GOVERNMENTAL CLOUD IN ROMANIA

VASILE-DANIEL PĂVĂLOAIA
Alexandru Ioan Cuza University of Iași
Iasi, Romania
danpav@uaic.ro

VALERICĂ GREAVU-ȘERBAN
Alexandru Ioan Cuza University of Iași
Iasi, Romania
valy.greavu@outlook.com

Abstract
Although it brings numerous opportunities for the government and its citizens, the implementation of a governmental cloud is a complex and tedious process that involves a wide range of technical, operational, and political challenges. The manuscript aims to explore some of the most significant challenges together with the measures to counteract them as well as the opportunities of implementing a governmental cloud. Further, the article compares the particularities of Romania with other European countries that went throughout the process of implementing similar projects on Governmental Cloud.
Keywords: *Governmental Cloud; Public Sector Digitalization; IT for public sector.*
JEL Classification: M15, G19, H75.

1. INTRODUCTION

The roots of Governmental Cloud (GC) can be traced back to the early days of cloud computing in the early 2000s, when private companies began to adopt cloud computing to improve efficiency and reduce costs. Governments soon recognized the potential of cloud computing to deliver better services to citizens, reduce costs, and improve operational efficiency, leading to the development of GC services (Ivanus and Iovan, 2014; Me, 2014). As the cloud serves as the foundation for the GC as it provides a secure and scalable platform for public sector operations, the beginning of GC is strictly connected with the emergence of cloud computing.

Therefore, in US, the Federal Risk and Authorization Management Program (FedRAMP) was established in 2011 (Warren and Sabetto, 2018) and aimed at providing a standardized approach to security assessment, and to monitoring cloud products and services provided to federal agencies. This action is among the pioneering actions and thus can be perceived as an essential step in promoting the

use of cloud technology in the US government operations (Me, 2014; Wang *et al.,* 2016).

Related to the emergence of cloud computing in Europe, the first adoptions commenced by 2012 when the European Commission adopted a strategy for "Unlocking the potential of cloud computing in Europe" (Ivanus and Iovan, 2014; Deloitte, 2021).

The current state of GC approaches varies across different countries and regions of the world. Some have fully implemented GC platforms by developing national GC platforms, while others are just beginning to explore the possibilities of cloud computing in the public sector. It is widely known that GC adoption has been driven by a range of factors, including the need for increased efficiency, the desire to improve services, and the urge to modernize aging IT infrastructure (David *et al.,* 2023) especially during crisis such as Covid-19.

2. BENEFITS AND LIMITS ASSOCIATED WITH THE IMPLEMENTATION OF GCS

Implementation of a GC brings numerous benefits for government, such as increased efficiency, viable access to public/government services, evolved data analytics, and increased innovation. However, there are also significant challenges associated with implementing a GC, including security, ethic issues and privacy concerns (Wang *et al.,* 2016), compliance with regulations, interoperability, and high cost (Me, 2014).

Among the challenges, warranting the security (Wang *et al.,* 2016) and privacy of sensitive government data (Joshi, Islam and Islam, 2017; Brandis *et al.,* 2019) are on top. As a result, Governments must protect confidential information, such as citizen data, financial (classified) information, from unauthorized access and eventual cyberattacks. Data breaches could have serious consequences, including damage to the government's reputation and potential legal liability. Thus, it is critical that the GC should be developed with a primary focus on security (Choi and Lee, 2015) and that appropriate measures are implemented to protect the data. Moreover, some authors (Joshi, 2017) recommend that the challenges of security and privacy should be addressed before adopting GC.

Further, the challenge associated with implementing a GC can be related to existing regulations (Me, 2014) such as GDPR for example (Joshi, Islam and Islam, 2017). It is known that Governments implemented a range of regulations that must be followed when developing a cloud solution and it includes data protection and privacy regulations. Governments must ensure that the cloud provider selection is compliant with the existing regulations, and that they have adequate precautions in place to prevent eventual data breaches. Besides, (Joshi, Islam and Islam, 2017) declares Governments should develop their own regulations for cloud computing.

Interoperability is also a significant challenge when it comes to implementing a GC (Joshi, 2017). Different government agencies often use different systems and data formats, which can create difficulties when trying to integrate these systems into a unified cloud-based solution. Ensuring that the GC is interoperable with existing systems and data formats is crucial to ensure that different government agencies can work together effectively. Some manners to achieve interoperability can be: using open standards (Joshi, Islam and Islam, 2017), creating a central repository of government data (Brandis *et al.,* 2019), developing a cloud interoperability framework (Brandis *et al.,* 2019).

Cost is a significant challenge when it comes to implementing a GC and some (David *et al.,* 2023) consider it a barrier. Although implementing a GC can be expensive (requires important investments in hardware, software, and personnel) ways to minimize the costs can be obtained, such as (David *et al.,* 2023) sharing resources with other government agencies, using open-source software, and choosing a cloud computing provider that offers a pay-as-you-go pricing model. Nevertheless, Governments must ensure that they have the budget to support the costs and that they are able to justify it to citizens and stakeholders.

Despite the challenges associated with implementing a GC, there are also numerous opportunities provided by GC. One of them is increased efficiency (David *et al.*, 2023) and it is perceived as a long-term benefit. Thus, by implementing a GC, agencies can increase their operational efficiency, streamline their processes, and reduce the costs associated with managing and storing data. This can help governments provide better services to their citizens and make more effective use of limited resources (Deloitte, 2021).

Improved access to government services is another opportunity presented by the implementation of a GC (Zhang *et al.,* 2022) especially by providing a single point of access. Citizen can access government services and information from anywhere, at any time, using any device. In this way, it facilitates the engagement of citizens with government agencies. Moreover, it offers access to the information they need and can help to improve transparency and accountability of their interaction within GC.

Enhanced data analytics capabilities of a GC are also perceived as opportunities (David *et al.,* 2023) for governments. Due to the increased amount of data generated by government actions, they can use cloud-based data analytics tools to get insights into the performance of their agencies, calls, programs, and services offered. Thus, governments can make superior decisions, increase their overall performance, and enhance their ability to provide optimal services to its citizens.

Moreover, the implementation of a GC can also foster increased innovation. By embracing cloud technology, governments can encourage innovation and experimentation and encourage the development of new solutions to complex problems (Zhang *et al.,* 2022), and share ideas and technologies with external

partners (Choi and Lee, 2015). This can allow governments to keep pace with the rapidly evolving technological (Zwattendorfer *et al.,* 2013) landscape and to remain competitive in a global context (Deloitte, 2021).

3. THE CASE OF ROMANIA AMONG CENTRAL AND EASTER EUROPEAN COUNTRIES

Romania, as well as several other Eastern and Central European countries (David *et al.,* 2023) lag behind the Western European countries in the adoption of GC services. In the recent years, these countries have made significant progress and striving to catch up with Western Eu countries. Initiatives such as the European Union's Digital Single Market Digital (EU Digital Market, 2023), Digital Agenda for Europe (EU Digital Agenda, 2020) and The Recovery and Resilience Facility (EU Resilience, 2023) help in promoting digitalization and the adoption of GC services across the EU region, and it is likely that we will see further progress in the coming years (Deloitte, 2021). A comparison (Zwattendorfer *et al.,* 2013) among the initiatives and implementations towards GC in the Eastern and Central European countries (David *et al.,* 2023) is presented in Table 1.

Table 1. The current status of GC adoption in Eastern and Central European countries

Country	GC Adoption Status	Initiatives/Programs (weblinks)
Poland (Shah, 2018; Hieronimus *et al.,* 2022; Joshi, 2017)	Medium	Polish National Cloud (Chmura Krajowa) GovTech Poland https://www.gov.pl/web/govtech
Czech Republic (Ondrak and Neuwirth, 2017)	Medium	Public Administration Services https://portal.gov.cz
Hungary (Telecompaper, 2014)	Medium	Hungarian eGovernment https://nisz.hu/en/services/egovernment
Romania	Low-Medium	Romanian eGovernment platform https://www.e-guvernare.ro/
Slovakia	Low	Slovak Governmental Cloud https://www.mirri.gov.sk/
Bulgaria	Low	State e-Government Agency (SEGA) https://e-gov.bg
Croatia	Low	- e-Citizens Platform https://gov.hr/en/e-government/18
Slovenia	Low	Slovenian State Cloud DRO NIO - National Interoperability Framework Portal https://nio.gov.si/

Country	GC Adoption Status	Initiatives/Programs (weblinks)
Serbia	Low	eUprava - Portal of e-administration of the Republic of Serbia www.euprava.gov.rs
Montenegro	Low	eGovernment portal of Montenegro https://www.euprava.me/en

Source: computed by authors

As depicted from Table 1, the countries with low level of GC adoption status are in the early stages of implementing services related to GC. Although they have made some progress towards implementing GC services, they must pursue additional efforts to catch up with the leading EU countries (Wang *et al.,* 2016). The countries with low adoption of GC, are facing a range of challenges, including inadequate digital infrastructure, limited funding, and a lack of skilled IT professionals. But, with the help of EU's projects and internal efforts, soon, these countries will be aligned in terms of IT infrastructure to the EU's standards.

Estonia is considered Europe's leader in GC adoption by building a digital society (Kattel and Mergel, 2019). In 2016, Estonia launched the Tiger Leap Initiative (e-Estonia, 2023), throughout a country-wide IT infrastructure development program, which provides a secure, scalable, and cost-effective platform for delivering government services. Ever since, the Estonian government made important progress in digitalizing the public services and moving in the cloud. Sources (e-Estonia, 2023) mention that over 95% of all government services available online. This has led to significant cost savings and increased efficiency, enabling the government to deliver better services to citizens and businesses.

The three Baltic countries (Latvia, Estonia, and Lithuania) are the states that have made significant progress in adopting GC solutions, having a high level of adoption status (Zwattendorfer et al., 2013), as displayed in Table 2.

- Latvia has a dedicated Government Cloud Project aiming to provide efficient and secure IT infrastructure and services for the Government and public institutions (Van de Walle *et al.,* 2018).
- Estonia has a well-established Government Cloud (e-Estonia, 2023) that includes the widely recognized X-Road platform, which enables secure data exchange and interoperability among government agencies and other stakeholders (Kattel and Mergel, 2019).
- Lithuania has implemented Digital Government Platform and established a National Data Center, which serves as a central hub for government data storage and processing, facilitating digital services delivery (Ali, Soar and Yong, 2014).

Table 2. The current status of GC adoption in Baltic countries

Country	GC Adoption Status	Initiatives/Programs
Latvia (Joshi, 2017; Van de Walle *et al.,* 2018)	High	Government Cloud Project - Portal of State Administration Services https://latvija.gov.lv/
Estonia (e-Estonia, 2023)	High	X-Road, Estonian Government Cloud https://e-estonia.com/solutions/e-governance/government-cloud/
Lithuania (Ali, Soar and Yong, 2014).	High	Digital Government Platform https://digital-lithuania.eu/digitalgovernment/

Source: computed by authors

These Baltic countries are ahead in terms of GC adoption compared to Eastern and Central European countries mentioned in Table 1, which generally have moderate to low adoption status. The Baltic states have been known for their digital transformation (Zhang *et al.*, 2022) efforts and have been recognized as leaders in e-government and digital governance in Europe. The initiatives/programs in the Baltic states are well-established and have a strong focus on providing efficient and secure government IT infrastructure, services, and data management.

To follow the Baltic countries, in Table 3 there are mentioned the prospective steps that Romania should take.

Table 3. The steps that Romania could take to follow Baltic's countries lead in terms of digitalization

Area	Steps Romania should take
Digital Infrastructure	Increase investment in digital infrastructure, particularly in rural and remote areas, and prioritize the development of high-speed broadband networks (Me, 2014)
Raising the awareness for Digital Skills	Develop and promote digital skills training programs for individuals and businesses, particularly in high-demand areas such as cybersecurity and data analytics (Livingstone, Mascheroni and Stoilova, 2023)
Digital Adoption among Business sector	Provide financial advantages and support for businesses to adopt digital technologies and processes, and develop public-private partnerships to support digital innovation (Kraus et al., 2022)

Area	Steps Romania should take
Cybersecurity Measures	Strengthen cybersecurity measures at the national and organizational levels, including through the development of cybersecurity strategies and increased collaboration with international partners (Livingstone, Mascheroni and Stoilova, 2023)
Digital Literacy in Education sector	Incorporate digital literacy and skills development into school curricula at all levels, and provide support and resources for teachers to integrate technology into their classrooms (Livingstone, Mascheroni and Stoilova, 2023)
Targeted Training for Workers	Develop targeted training programs for workers in high-demand industries and occupations, particularly in the areas of digital technology and innovation
Private Sector Involvement	Encourage private sector involvement in digital innovation and development through funding, tax incentives, and other forms of support (Păvăloaia *et al.,* 2019)
Lifelong Learning	Develop and promote lifelong learning opportunities (David *et al.,* 2023) for individuals, including online learning platforms, vocational education and training programs, and financial support for training and education (Păvăloaia *et al*., 2019).

Source: computed by authors

By taking the steps illustrated in Table 3, Romania can work towards improving its digital infrastructure, developing a digitally skilled workforce, and promoting innovation and growth in its economy.

4. CONCLUSIONS AND FUTURE PATHS

To sum up, while the implementation of a GC presents significant challenges, it also provides numerous opportunities (David *et al.,* 2023) for governments to improve their operations and provide better services to their citizens. By addressing the challenges and taking advantage of the opportunities presented by cloud technology, governments can enhance their efficiency, transparency, and accountability, and remain competitive in an increasingly digital world.

The future perspectives for GC will be shaped by a range of trends and developments, identified in the literature, including:

Higher adoption of cloud services: As cloud services become more ubiquitous and cost-effective, governments are likely to increasingly adopt GC services (Abied *et al.,* 2022).

Emphasis on cybersecurity: As the growing threat of cyber-attacks, governments have to prioritize cybersecurity in their GC strategies, implementing appropriate security measures to protect against threats (Choi and Lee, 2015; Wang *et al.,* 2016).

Emerging technologies integration: GC should be integrated with emerging technologies such as Artificial Intelligence and the Internet of Things, enabling governments to deliver more elaborated services to its citizens.

Growth of shared services: Shared GC services are likely to expand, with governments collaborating to share resources and infrastructure, by minimizing costs and maximize efficiency.

Increased attention to (data) privacy: Due to the growing importance of data privacy, governments must ensure that their GC services comply with relevant regulations and protect citizens' private information.

Overall, the actual state of GC adoption varies widely across different countries and regions. While some countries have fully embraced GC and have established national GC platforms, others are just beginning to explore the possibilities of cloud computing in the public sector. Nonetheless, the benefits of GC are clear, and governments worldwide are likely to increasingly adopt GC services in the coming years to improve service delivery, reduce costs, and modernize aging IT infrastructure.

References

1) Abied, O., Ibrahim, O., Kamal, S. N., Alfadli, I. M., Binjumah, W. M., Ithnin, N. and Nasser, M. (2022). Probing Determinants Affecting Intention to Adopt Cloud Technology in E-Government Systems. *Sustainability*, 14(23), 15590. https://doi.org/10.3390/su142315590.
2) Ali, O., Soar, J. and Yong, J. (2014). Impact of cloud computing technology on e-government. In: *Information and Software Technologies: 20th International Conference, ICIST 2014, Druskininkai, Lithuania, October 9-10, 2014. Proceedings 20*, pp. 272-290. Springer International Publishing.
3) Brandis, K., Dzombeta, S., Colomo-Palacios, R. and Stantchev, V. (2019). Governance, Risk, and Compliance in Cloud Scenarios. *Applied Sci*ence, 9, 320. https://doi.org/10.3390/app9020320.
4) Bulgaria (2023). *State e-Government Agency (SEGA)*. [online] Available at: https://e-gov.bg [Accessed 3.05.2023].
5) Choi, M. and Lee, C. (2015). Information Security Management as a Bridge in Cloud Systems from Private to Public Organizations. *Sustainability*, 7, 12032-12051. https://doi.org/10.3390/su70912032.
6) Croatia (2023). *e-Citizens Platform*. [online] Available at: https://gov.hr/en/e-government/18 [Accessed 3.05.2023].
7) Czech Republic (2023). *Public Administration Services*. [online] Available at: https://portal.gov.cz [Accessed 3.05.2023].
8) David, A., Yigitcanlar, T., Li, R. Y. M., Corchado, J. M., Cheong, P. H., Mossberger, K. and Mehmood, R. (2023). Understanding Local Government Digital Technology Adoption Strategies: A PRISMA Review. *Sustainability*, 15, 9645. https://doi.org/10.3390/su15129645.
9) Deloitte (2021). *Digital Government: How the EU cannot miss the cloud opportunity*. [online] Available at: https://www2.deloitte.com/ content/dam/

Deloitte/dk/Documents/public-sector/20211129-cloud-gps-eu.pdf accessed on March 2023 [Accessed 3.05.2023].
10) EU Digital Market (2023). *Digital single market for Europe.* [online] Available at: https://www.consilium.europa.eu/en/policies/digital-single-market/ [Accessed 3.05.2023].
11) EU Digital Agenda (2020). *Digital Agenda for Europe (2010-2020)*. [online] Available at: https://www.europarl.europa.eu/factsheets/en/sheet/64/digital-agenda-for-europe#:~:text=The%20European%20digital%20agenda%20for,goal%20of%20climate%20neutrality%20by [Accessed 3.05.2023].
12) EU Resilience (2023). *The Recovery and Resilience Facility*. [online] Available at: https://ec.europa.eu/commission/presscorner/detail/ro/qanda_21_1870 [Accessed 3.05.2023].
13) e-Estonia (2023). [online] Available at: https://e-estonia.com/story/ [Accessed 3.05.2023].
14) Estonia (2023). *X-Road, Estonian Government Cloud.* [online] Available at: https://e-estonia.com/solutions/e-governance/government-cloud/ [Accessed 3.05.2023].
15) Hieronimus, S., Marciniak, T., Novak, J., Pastusiak, B., Purta, M. and Sokoliński, O. (2022). *Cloud 2030: Capturing Poland's potential for accelerated digital growth*. McKinsey Digital. [online] Available at: https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/cloud-2030-capturing-polands-potential-for-accelerated-digital-growth [Accessed 3.05.2023].
16) Hungary (2023). *Hungarian eGovernment.* [online] Available at: https://nisz.hu/en/services/egovernment [Accessed 3.05.2023].
17) Ivanus, C. and Iovan, S. (2014). Governmental cloud-part of cloud computing. *Informatica Economica,* 18(4), pp. 91-100.
18) Joshi, P. R., Islam S. and Islam S. (2017). A Framework for Cloud Based E-Government from the Perspective of Developing Countries. *Future Internet*, 9(4), 80. https://doi.org/10.3390/fi9040080.
19) Kattel, R. and Mergel, I. (2019). Chapter 8 - Estonia's digital transformation: Mission mystique and the hiding hand. In: M. E. Compton and P.T. Hart, *Great Policy Successes*, Oxford University Press, pp. 143-160. [online] Available at: https://library.oapen.org/bitstream/handle/20.500.12657/23594/9780198843719.pdf?se#page=158 [Accessed 3.05.2023].
20) Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N. and Weinmann, A. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management*, 63, 102466. https://doi.org/10.1016/j.ijinfomgt.2021.102466.
21) Latvia (2023). *Government Cloud Project - Portal of State Administration Services*. [online] Available at: https://latvija.gov.lv/ [Accessed 3.05.2023].
22) Lithuania (2023). *Digital Government Platform*. [online] Available at: https://digital-lithuania.eu/digitalgovernment/ [Accessed 3.05.2023].
23) Livingstone, S., Mascheroni, G. and Stoilova, M. (2023). The outcomes of gaining digital skills for young people's lives and wellbeing: A systematic evidence review. *New media & society*, 25(5), pp.1176-1202.

24) Me, G. (2014). Migration to Governmental Cloud Digital Forensics Community: Economics and Methodology. *Economics of Grids, Clouds, Systems, and Services* (Gecon 2014), 8914, pp. 114-129. doi: 10.1007/978-3-319-14609-6_8.
25) Montenegro (2023). *eGovernment portal of Montenegro*. [online] Available at: https://www.euprava.me/en [Accessed 3.05.2023].
26) Ondrak, V. and Neuwirth, B. (2017). Cloud computing in the public sector of the Czech Republic. In: *Teoria şi practica administrării publice*. Chișinău, Republica Moldova: Elan Poligraf Publishing House, pp. 493-498.
27) Păvăloaia, V. D., Georgescu, M. R., Popescul, D. and Radu, L. D. (2019). ESD for Public Administration: An Essential challenge for inventing the future of our society. *Sustainability*, 11(3), 880; https://doi.org/10.3390/su11030880.
28) Poland (2023). *Polish National Cloud (Chmura Krajowa) GovTech Poland*. [online] Available at: https://www.gov.pl/web/govtech [Accessed 3.05.2023].
29) Romania (2023). *Romanian eGovernment platform*. [online] Available at: https://www.e-guvernare.ro/ (Accessed 3.05.2023).
30) Shah, S. (2018). PKO and PFR to launch Polish National Cloud. *Emerging Europe*, vol. Business, October 30. [online] Available at: https://emerging-europe.com/business/pko-and-pfr-to-launch-polish-national-cloud/ [Accessed 14.06.2023].
31) Serbia (2023). *eUprava - Portal of e-administration of the Republic of Serbia*. [online] Available at: www.euprava.gov.rs [Accessed 3.05.2023].
32) Slovakia (2023). *Slovak Governmental Cloud*. [online] Available at: https://www.mirri.gov.sk/ [Accessed 3.05.2023].
33) Slovenia (2023). *Slovenian State Cloud DRO NIO - National Interoperability Framework Portal.* [online] Available at: https://nio.gov.si/ [Accessed 3.05.2023].
34) Telecompaper (2014). Hungary completes 'government cloud' project. *Budapest Business Journal*. [online] Available at: https://www.telecompaper.com/ news/hungary-completes-government-cloud-project--1000460 [Accessed 3.05.2023].
35) Van de Walle, S., Zeibote, Z., Stacenko, S., Muravska, T. and Migchelbrink, K. (2018). Explaining non-adoption of electronic government services by citizens: A study among non-users of public e-services in Latvia. *Information Polity*, 23(4), pp. 399-409.
36) Zhang, R., Li, Y., Li, H. and Wang, Q. (2022). Evolutionary Game Analysis on Cloud Providers and Enterprises' Strategies for Migrating to Cloud-Native under Digital Transformation. *Electronics*, 11, 1584. https://doi.org/10.3390/electronics11101584.
37) Zwattendorfer, B., Stranacher, K., Tauber, A. and Reichstädter, P. (2013) Cloud computing in e-government across Europe a comparison. *Artificial Intelligence and Lecture Notes in Bioinformatics*, 8061(LNCS), pp. 181-195. doi: 10.1007/978-3-642-40160-2_15.
38) Wang, Z., Zhang, T., Yang, Y. and Qu, H., (2016). Comparison of security frameworks for governmental clouds between United States and European Union. In: *C3 - ACM International Conference Proceeding Serie*s, pp. 30-34, doi: 10.1145/3017971.3017985.
39) Warren, K. and Sabetto., R. (2018). *FedRAMP: A Practical Approach*. [online] Available at: https://www.mitre.org/sites/default/files/2021-11/prs-18-2368-fedRAMP-a-practical-approach.pdf [Accessed 3.05.2023].