

Modern Technologies in Public Administration Management: A Comparison of Estonia, India and United Kingdom

**Wadim STRIELKOWSKI¹, Inna GRYSHOVA²,
Svetlana KALYUGINA³**

Abstract: *Our paper focuses on the use of modern technologies in public governance in public sector management. We apply the multidisciplinary cross-country comparison of the three countries represented by Estonia, India and the United Kingdom and analyse the depth of use and the functionality of ICT in public sector (voting, biometric identification and personal IDs). Our results show that if properly implemented and managed, novel information and communication technologies (ICTs) might represent a breakthrough in traditional state and municipal management. However, the governments interested in implementing these technologies should also ensure the personal data protection of its citizens as well as to be ready to face security attacks from hacker groups and hostile regimes. Our results might be relevant for policy-makers and stakeholders in the countries considering the implementation of similar schemes in their public administration management. Our findings might help to channel the consideration which ICT e-government scheme might be better to implement and to use and what to expect from its usage and implementation.*

Keywords: *public governance, state and municipal management, e-governance, ICTs*

JEL : *H67, H80, O38*

Introduction

Modern technologies (represented by the information and communication technologies, or so-called ICTs) are slowly but gradually taking over the public governance and are more frequently used in state and municipal management (Fath-Allah et al., 2014). They constitute one of the pathways towards building a smart city, a concept that embeds the efforts of many municipal governments across the world (see Romolini et al., 2015; Alpopi and Silvestru, 2016).

ICTs can facilitate the way governmental services are provided for the citizens: from job search portals to the websites and apps that help to collect citizens' opinions of the way municipalities are managing their districts and

¹ Research Associate, Ph.D.; University of Cambridge; Cambridge; United Kingdom; e-mail: strielkowski@cantab.net

² Senior Research Fellow, Ph.D.; Legislation Institute of the Verkhovna Rada of Ukraine; Kiev; Ukraine; e-mail: zak_norm@rada.gov.ua

³ Associate Professor, Head of the Department of State and Municipal Management; Institute of Economics and Management, North-Caucasus Federal University; Stavropol; Russian Federation; e-mail: s.kalyugina@gmail.com

administrative units. However, the most interesting and impressive application of the ICTs might be for the identification of citizens and enabling them to participate in the public life online through the Internet (Pollifroni, 2014). The ubiquitous use of smartphones and other hand-held devices anyone would hardly imagine his or her life nowadays makes this task even more appealing and important.

To the best of our knowledge not much has been written on the modern technologies in public administration and management in a way of a cross-country comparison in the relevant research literature. Many authors analyse the use of ICTs or government portals in single countries, such as Estonia or India (see e.g. Arora, 2008; or Bhatia and Bhabha, 2017), however there has been no attempt to compare several outstanding cases together as well as to assess the case of the country where ICT services are not that widespread in public administration (such as the United Kingdom). All of the above constitutes the originality of our paper.

This paper is structured as follows: Section 1 presents the literature review of the relevant research literature dedicated to the issues of using modern ICTs in public administration. Section 2 briefly outlines our methodology. Section 3 provides a comprehensive analysis of ICT government public administration programmes in Estonia. Section 4 provides a thorough analysis of ICT government public administration programmes in India. Section 5 provides an overview of ICT government public administration programmes in the United Kingdom. Section 6 provides a comparison of all programmes and initiatives in question. Finally, the Conclusions section summarizes the main findings and draws conclusions and policy implications for the relevant stakeholder and policy-makers.

1. Literature overview

Modern information and communication technologies are crucial for the proper functioning of the modern public administration and state and public sector management. With the growing importance of Internet and information and communications solutions that help to facilitate our daily tasks, many governments in the world are embracing the novel and innovative solutions for the routine tasks such as providing information from the public registers, confirming ownership of the property, verifying signatures at important documents, or even enabling its citizens to vote online as in the case of Estonia (Maaten, 2004). There are many other domains too: for example, Ionescu (2015) show how e-government can be helpful in curbing the corruption in public administration (Kozubíková et al., 2017).

Moreover, Nica (2015) shows that digitalized public administration can also become a tool for the sustainable development. In the absence of burdensome necessity to travel tens of kilometres to authorize a copy of the document or to sign a paper in the presence of a notary, people can save time, fuel and money (not speaking of the congestions and traffic jams) and contribute to the sustainable growth (Krpálek et al., 2016).

Scott et al (2015) discuss the success of e-government systems stating that that success is often perceived through the way how the citizens value it and assess its importance and relevance (Rakauskienė & Volodzkienė, 2017). With regard to this, another use of modern ICT for the state and public management can be envisaged – namely the possibility to evaluate the existing e-services through the new e-service (for example an online form or a mobile app) that would enable the citizens (in a way, potential user of e-governments services and innovations) to evaluate the existing services and to come up with the suggestions for the new e-government solutions in real time (Bilevičienė et al., 2015; Solek, 2014).

Pang et al (2014) discuss the issue of value of ICT that is created in governments. They point out that while in the case of implementations of ICT solution in for business have been studied extensively, few studies tackled the same issue in case of state and public administration. Thence, there is a clear need for studying this field further and for inventing the new solutions and implementation of the e-government services.

2. Methodology

Our methodology is based on the cross-country comparison of the three countries that have already introduced, recently introduced, and are considering to introduce the ICT solutions to their state and public management systems. We have selected a comprehensive analysis of Estonia, a pioneer in the Internet-based modern technologies used for e-government solutions followed an overview of India's Aadhaar digital ID number scheme that has been recently introduced with a great degree of success. Moreover, we are also considering a case of the United Kingdom that is about to part ships with the European Union and might be in need of some new forms of government IDs and e-governance schemes that might save lots of funds of the state budget and help the country to overcome the burden of the "European divorce".

3. ICT in public administration management in Estonia

The use of modern ICTs in Estonia both in governance and public sector has placed the nation at the forefront of countries which aim to modernize the public sector and as well offer transparent governance. Estonian residents and citizens can access many online public services which include internet voting, online medical prescriptions, electronic tax filing, digital signatures and ultimately, digital identification. Motivated by accessibility, many services are efficient in terms of time and money which the customers and public officers save. For instance, marketing a motor vehicle in the country may be accomplished remotely within fifteen minutes, while filing taxes online takes an average individual not over five minutes and participation in voting through internet voting normally takes 90 minutes (Kristjan, 2017).

In addition to all public services offered online by the government agencies to their clients, they are truly extensively accepted and used by the people. Digital identification is the backbone of modern digital democracy and is mandatory for all residents and in the year 2014, it was utilized over 80 million and 35 million times for authentication and digital transactions respectively (Vassil et al., 2016). 95% of all revenue tax statements are filed online, and all third citizens engaged in online voting during the past two polls. Concerning the degree of behaviour and attitudes of users, study evidence has indicated that online services offered by the government are considered as reliable and trustworthy. Populaces anticipate their delivery, while government bureaus view online existence not as an option, but rather as an inevitable a strategic portion of their daily activities (Anthes, 2015).

The widely acclaimed and reported success of Estonia to convert their public services online was fundamentally driven by the widespread usage of electronic ID-cards (Maaten, 2004). From 2002, roughly 1.2 million of these personal ID-documents which are the size of credit cards have been issued, and thus allowed inhabitants to digitally identify themselves and also sign actions or documents. Identification cards are compulsory for every citizen and they are in the same way valid for physical and digital identification. Because of their convenient size, they can fit well into a normal wallet compared to a passport and they are frequently used as the single identification document which individuals carry everywhere. In physical terms, they are valid for a person to be identified in Estonia, but more significantly, they are as well used for travelling in many European states (Björklund, 2016). Therefore, together with their principal functionality, digital identification cards are successfully employed as substitutes for traditional identification IDs (Drechsler, Madise, 2002).

The digital functionality of identification cards is founded on a microelectronic chip as well as the dual pin codes which come with the cards. Through the use of smart card reader as well as an internet-connected computer, Estonian citizens may utilize the two central functions offered by the identification card, which are both crucial to the growth of e-government; digital signature (associated with PIN2) and personal authentication (associated with PIN1). The first pin-code enables the people to authenticate their identity for the matching e-service to know the user's identity. Such is the initial step which offers basic empowering infrastructure for providing personalized services as well as information through online modes. Most of the services operate fully on only basis of authentication that is, reviewing personal health records, inspecting the validity of motor vehicle insurance, or reviewing the number of political applicants in each district of voters. The use of the second pin-code is to approve online transitions or sign documents. For example, obtaining the insurance policy, confirmation of the submission of the tax declaration, or voting in elections (Kalvet, 2012; Kristjan, 2017).

Functionality is of importance for distinguishing between signing and authentication as they allow various forms of services. Perhaps, online voting is the best case for illustrating the variation. While voting, people download voting

applications to their personal computers and the system requests for their identification, which they do using their IDs and the first pin-code for the voting system to know the individual behind the computer. Subsequently, the system verifies whether the person is an eligible voter in the elections and when affirmative, presents a list of candidates in his district (Martens, 2010). Thus, this is the portion of the service which uses the digital ID-card's authentication functionality, enabling eligible voters to look through various political applicants. Thus far, there is no digital signature required. Nevertheless, the second pin-code; the validation task is used in confirming the elector's choice in casting an e-vote. It is a transactional component of the communication between the state and citizens. Once inserted properly, the e-vote is sent to the server and would be tallied at a suitable period as the online voting processes prescribe (Arora, 2008).

The dissimilarity between transaction and authentication is essential as in nearly every aspect of government e-services, subject to the nature of services. So, customers are necessitated to utilize the digital identification card for digital signatures, authentication or the two. An example which is very similar can be applied to online banking, where clients first use their first pin-code for entering their account, checking the balance, and browsing their assets. However, when they purpose to execute an actual transfer of money, they should use the second pin code. The main institutional requirement for digital identification is the state ID system that aids to distinctively recognize the citizens of Estonia; while the Population Register, which is the biggest fundamental data source of personal information as well as family occasions (European Union, 2016).

4. ICT in public administration management in India

Similar to the digital identification used by Estonia, India has also a corresponding digital identification known as "Aadhaar" (after a Hindu word for "Foundation"). The implementation of the system seemed like an impossible and futuristic task first, but proved to be a very successful endeavour encompassing nearly all citizens of India in 5 years (see Figure 1).

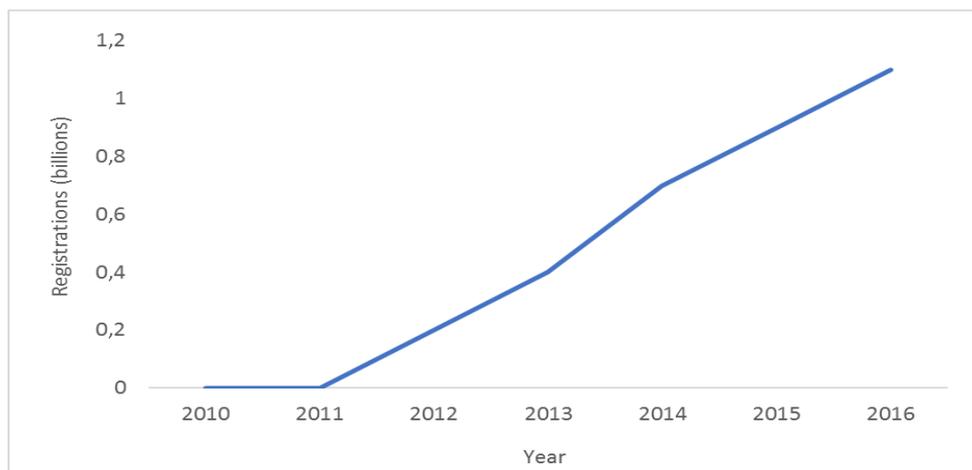


Figure 1. Aadhaar registrations in India (2010-2016)

(Source: Indian National Statistics, 2017)

Basically, Aadhaar is a twelve-digit unique identification number which each Indian citizen is issued with, on the basis of their demographic and biometric data. Such data is obtained by the UIDAI (Unique Identification Authority of India), a state authority created on 12th July by the Indian Government, under the Ministry of Electronics and Information Technology, under the 2016 Aadhaar Act's provisions. Aadhaar is the biggest biometric identification system globally, with more than 1.133 billion members registered as of March 31st, 2017 (Masiero, 2015; Bhatia and Bhabha, 2017).

Table 1. Aadhaar number generations (per average day)

Gender	Age Band	Aadhar generated	Enrolment rejected
Female	0 to 4 Years	49993	6030
Female	5 to 17 Years	49844	2675
Female	18 to 30 Years	15880	1255
Female	31 to 45 Years	6476	563
Female	46 to 65 Years	4961	375
Female	66 Years and Above	3364	170
Male	0 to 4 Years	56689	5794
Male	5 to 17 Years	56323	2564
Male	18 to 30 Years	17610	1139
Male	31 to 45 Years	11637	612
Male	46 to 65 Years	7533	472
Male	66 Years and Above	3106	173

(Source: Indian National Statistics, 2017)

There are tens of thousands of Indian citizens registered for Aadhar every day. Table 1 that is depicted above reports the average number of registrations for females and males per an average day. One can clearly see that the numbers of younger citizens registered into the system are higher than those of mature age.

Today, 99 percent of Indians with the age of 18 and above are registered on Aadhaar. The UIDAI has the mandate of assigning a twelve-digit UID number to each Indian citizen. The UID (Unique identification) scheme's implementation comprises generating and assigning UID to citizens; which defines the procedures and mechanisms for linking UID with partner databases; operating and managing all phases of UID lifecycle; establishing policies and processes for updating mechanism and describing usage and applicability of UID for delivering different services amongst others. The number is connected to the basic biometric and demographic information of the resident such as two iris scans, ten fingerprints and a photograph kept in a centralized database (Siddiqui and Singh, 2015).

5. ICT in public administration management in the United Kingdom

Conversely, the government of United Kingdom has adopted e-government infrastructures and services which help it to deliver various services to its citizens. However, as opposed to India and Estonia, UK has not yet established a digital identification system but rather different e-government infrastructures. The main infrastructures include portals (www.gov.uk), which the UK government's website for providing the citizens and businesses in Wales and England with effective and easy digital access to every public service and associated information.

Also, there are networks such as Government Secure Internet (GSi), Public Service Network (PSN) and Government Connect Extranet (GCSx). The government as well as an e-Authentication or e-Identification system known as the Government Gateway platform which the UK's key identification platform and a major authentication and registration engine that allows secure authenticated e-government transaction to occur via the internet. Another infrastructure is the security infrastructure which is the "*Global system for checking fingerprints of visa applicants.*" Lastly, there are e-procurement systems including Government Procurement Service and 'xchangeWales' platforms. The UK operates a decentralized policy of e-procurement. The 'xchangeWales' platform is a program for enabling all organizations in the public sector in Wales as well as their suppliers to trade with one another electronically (European Union, 2014).

Moreover, the UK government has established e-government services for its populations. Overall, there are twelve services for citizens through the e-government programs. Such consist of income taxes: declaration, notification of assessment, social security benefits, job hunt services by labor agencies, and private documents: driver's license and passport services. Besides, there is the application for building permission, car registration, public libraries and declaration to the police, marriage, and birth certificate request and delivery and

enrollment in college services. Lastly, there is a declaration of moving services and health associated services (European Union, 2014).

In general, governments across the globe look to the usage of technology for bettering the services they offer to their citizens. The use of technology is not now an issue of the developed world, but also the developing countries are adopting modern technology, particularly in the public sectors to provide enhanced services to the people. The government of Estonia has adopted modern ICT in the public sector to enhance the quality of its services to the citizens. Estonian residents and citizens can access many online public services which include internet voting, online medical prescriptions, electronic tax filing, digital signatures and ultimately, digital identification. Similarly, India has not been left behind, and it now has the largest digital identification system called Aadhaar in the world. Finally, UK government has also embraced modern technology and it has established e-government infrastructures and services to serve its citizens better.

6. Cross-country analysis

Table 1 that follows, offers a cross-country comparison in terms of modern ICTs in state and public administration management in a form of a modified pivoted SWOT table. We are attempting to come up with the most characteristic features of each country in question by describing its main strengths, weaknesses, opportunities and threats.

In general, it appears that we are dealing with an interesting sample of countries ranging from the most ICT-advanced (represented by Estonia) which is also the least-advanced in the implementation of the rule of law due to its Soviet heritage and despite its EU membership in 2004, to the most bureaucratic one (represented by the United Kingdom) which is the hub of the modern democracy but in the same time also least-advanced in terms of implementation of the ICT solutions to its state and public administration. In between, there is India with its ambitious Aadhaar project that would help to digitalize the public records and make it possible to register and manage a vast number of voters and citizens in the world's largest democracy.

Table 1. Cross-country comparison

SWOT table			
Country's name	Estonia	India	UK
Strengths	Strong ICT solutions Favourable location Governmental support for new ICT solutions Small number of citizens	Strong ICT facilities ICT outsourcing hub Vibrant and dynamic entrepreneurial society	Pioneer in ICT solutions Established democracy Functioning public management Efficient state and public administration
Weaknesses	Young democratic traditions Proximity to Russia Large share of Russian-speaking population	Obsolete public administration Mixture of nations and languages Large population	Bureaucratic public administration Attractive country for international migration
Opportunities	Further improving e-voting system Shifting various governmental procedures to the Internet	Using Aadhaar for online shopping Using Aadhaar for combating terrorism Further uses of Aadhaar	Introducing new e-cards system Post-Brexit regulations outside the scope of the EU laws
Threats	Hacker group attacks Issues with the Internet security	Data leak on the Internet Hacker group attacks Personal data misuse	Hacker attacks Security breaches Lagging behind the EU

(Source: Authors, 2017)

7. Conclusions and discussions

Overall, it appears that information and communication technologies might constitute a breakthrough in the traditional approach to the way the state and municipal management is conducted. These solutions offer many innovative ways how the public administration might work and offer its services to the citizens who wish to save their time and money. In addition, it also offers solutions for turning the whole system of public administration to be managed under the principles of sustainability and balanced growth. Modern technologies might save millions for public administration budgets around the world and they seem to be very appealing and attractive for both young and old citizens. The increasing usage and the growing popularity of smartphones and other hand-held devices for virtually all everyday tasks as well as daily life and work make the challenge even more relevant.

Public governments can also use modern ICT for assessing both their services and the usage of e-governance they are already implementing. ICT solutions can provide cheap and efficient data that would be available for sophisticated analysis and would enable the policy-makers and stakeholders to base their decisions on public preference and needs.

Nevertheless, it has to be considered and remembered that governments interested in implementing ICTs in public sector should make sure that the personal data of its citizens are well-protected. Moreover, the governments who wish to embrace novel ICTs for their state and municipal management practices, also need to be ready to fight against possible security attacks from anonymous hacker groups and hostile regimes.

References

- Alpopi, C., & Silvestru, R. (2016). Urban development towards smart city-a case study. *Administratie si Management Public*, (27), pp.107-122.
- Anthes, G. (2015). Estonia: a model for e-government. *Communications of the ACM*, 58(6), pp.18-20.
- Arora, S. (2008). National e-ID card schemes: A European overview. *Information Security Technical Report*, 13(2), pp. 46-53.
- Bilevičienė T., Bilevičiūtė, E., Paražinskaitė, G. (2015). Innovative Trends in Human Resources Management, *Economics and Sociology*, 8(4), pp.94-109.
- Bhatia, A., & Bhabha, J. (2017). India's Aadhaar scheme and the promise of inclusive social protection. *Oxford Development Studies*, 45(1), pp.64-79
- Björklund, F. (2016). E-government and moral citizenship: the case of Estonia. *Citizenship Studies*, 20(6-7), pp. 914-931
- Drechsler, W., & Madise, Ü. (2002). E-voting in Estonia. *Trames*, 6(56/51), (3), pp.234-244.
- European Union (2014). E-Government in the United Kingdom. Retrieved from <https://joinup.ec.europa.eu/sites/default/files/98/c1/99/eGov%20in%20UK%20May%202014%20v.16.0.pdf>
- European Union (2016). E-government in Estonia. Retrieved from https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/eGovernment%20in%20Estonia%20-%20February%202016%20-%2018_00_v4_00.pdf
- Fath-Allah, A., Cheikhi, L., Al-Qutaish, R. E., & Idri, A. (2014). E-government portals best practices: a comprehensive survey. *Electronic Government, an International Journal*, 11(1/2), pp.101-132
- Indian National Statistics (2017). Aadhaar statistics. Available at: <https://data.gov.in/resources/aadhaar-generated-gender-age/download>

- Ionescu, L. (2015). The role of e-government in curbing the corruption in public administration. *Economics, Management, and Financial Markets*, (1), pp.48-53.
- Kalvet, T. (2012). Innovation: a factor explaining e-government success in Estonia. *Electronic Government, an International Journal*, 9(2), pp.142-157.
- Kozubíková, L., Homolka, L., Kristalas, D. (2017). The effect of business environment and entrepreneurs' gender on perception of financial risk in the SMES sector. *Journal of Competitiveness*, 9(1), March, pp. 36 – 50.
- Krpálek, P., Krpálková Krelová, K. (2016), Possibilities for developing business potential in economic education. Examples of implementation in Slovakia and the Czech Republic, *Economics and Sociology*, 9(4), pp. 119-133.
- Kristjan V. (2017). Estonian e-Government Ecosystem: Foundation, Applications, Outcomes. Retrieved from: <http://pubdocs.worldbank.org/en/165711456838073531/WDR16-BP-Estonian-eGov-ecosystem-Vassil.pdf>
- Maaten, E. (2004). Towards remote e-voting: Estonian case. *Electronic Voting in Europe-Technology, Law, Politics and Society*, (47), pp.83-100.
- Martens, T. (2010). Electronic identity management in Estonia between market and state governance. *Identity in the Information Society*, 3(1), pp.213-233.
- Masiero, S. (2015). Redesigning the Indian food security system through e-governance: The case of Kerala. *World Development*, (67), pp.126-137.
- Nica, E. (2015). Public Administration as a Tool of Sustainable Development. *Journal of Self-Governance and Management Economics*, 3(4), pp.30-36.
- Pang, M. S., Lee, G., & DeLone, W. H. (2014). IT resources, organizational capabilities, and value creation in public-sector organizations: a public-value management perspective. *Journal of Information Technology*, 29(3), 187-205.
- Pollifroni, M. (2014), Multidimensional Analysis Applied to the Quality of the Websites: Some Empirical Evidences from the Italian Public Sector, *Economics and Sociology*, 7(4), pp.128-138.
- Rakauskienė, O. G., Volodzkienė, L. (2017), The Inequality of Material Living Conditions in EU Countries, *Economics and Sociology*, 10(1), pp. 265-278.
- Romolini, A., Gori, E., & Fissi, S. (2015). Public corporate governance and performance information in local utilities: The different perceptions of politicians and managers. *Administratie si Management Public*, (25), pp.55-77.
- Siddiqui, A. U., & Singh, H. K. (2015). "Aadhar" management system. *IITM Journal of Management and IT*, 6(1), pp.40-43.

Scott, M., DeLone, W., & Golden, W. (2016). Measuring eGovernment success: a public value approach. *European Journal of Information Systems*, 25(3), pp.187-208.

Solek, A. (2014), Behavioral economics approaches to public policy, *Journal of International Studies*, 7(2), pp.33-45.

Vassil, K., Solvak, M., Vinkel, P., Trechsel, A. H., & Alvarez, R. M. (2016). The diffusion of internet voting. Usage patterns of internet voting in Estonia between 2005 and 2015. *Government Information Quarterly*, 33(3), pp.453-459.