Measuring Outcomes of Digital Transformation in Public Administration: Literature Review and Possible Steps Forward¹

Elena Dobrolyubova²

Abstract

Digital transformation is the modern mainstream of social and economic development promising significant digital dividends to citizens and businesses worldwide. The theory highlights the importance of digitalization for optimizing the public value of government services for citizens; however, despite the high enthusiasm about the prospects of digital transformation in public administration, there is little literature on measuring actual benefits this process might provide to all stakeholders concerned.

While some recent research suggests high correlation between governance indicators and e-government development, the causality between the two is not confirmed statistically for most public administration indicators. International indices used to measure government digitalization (such as the UN E-Government Development Index) often concentrate only on e-services and are based on measuring the availability rather than the actual use or quality of such modes of service delivery; they concentrate more on measuring G2C and, to some extent, G2B interactions and often omit the effects of digitalization for the G2G and G2E dimensions. The EU Digital economy and society index (DESI) is one of the most advanced cases for measuring the progress of digitalization in the EU, but even in this case the costs of digitalization and potential risks of digital government are not fully accounted for.

The paper provides an extensive review of theoretical and practical approaches to measuring government digitalization, identifies key limitations and proposes some steps for enhancing the existing practices. The paper argues that government digital transformation should not be performed for its own sake but should be a

1 The article was written on the basis of the RANEPa state assignment research program.

2 Center for Public Administration Technologies, Russian Presidential Academy of National Economy and Public Administration (RANEPa), Moscow, Russian Federation.

means for raising effectiveness and efficiency of public administration. Therefore, both benefits and risks of digital transformation of performing all core government functions for various stakeholders (citizens, businesses, government itself, and public officials) should be accounted for.

Keywords:

Businesses; citizens; civil servants; e-government; digital transformation; indicator; measurement; outcomes; public administration; stakeholders.

Introduction: Digital transformation in public administration

Digital transformation is the modern mainstream of social and economic development, promising significant digital dividends to citizens and businesses worldwide (World Bank 2016). In the area of public administration, the expectations about the digital technologies are also remarkably high. Some researchers claim digitalization to be a driver for the new governance concepts of digital era governance (Margetts and Dunleavy 2013) or ICT-enabled transformational government (Heidelberg 2009). Whether digital transformation forms a new governance paradigm or advances the current public administration reform approaches, there is a broad consensus that “technology does matter in the current public management reforms” (Vintar 2010).

The notion of digital transformation gained significant attention in literature (Vuksić et al. 2018). While the approaches to defining digital transformation vary (Reis et al. 2018), most authors suggest that digital transformation involves using ICT technology for creating fundamentally new capabilities in business, public government, and people’s life (Martin 2008) and radically improving performance or business reach (Westerman et al. 2011).

The theory highlights the importance of digitalization for optimizing the public value of government services for citizens (Bannister et al. 2014) as well as for raising the efficiency of government functions by implementing lean government models (Janssen and Estevez 2013). Digital technologies boost citizen participation (Luna-Reyes 2017) and support client engagement in public value co-production and co-creation (Cordella and Paletti 2018).

The recent research on digital transformation in public conducted based on expert interviews in several European countries suggests that key outcomes of digital transformation in government are related to institutional and organizational changes. It is therefore necessary to differentiate (i) digitization, characterizing the transition from analog to digital processes; (ii) digitalization, which focuses on potential changes in the processes beyond mere digitizing of existing processes and forms; and (iii) digital transformation, involving cultural, organizational, and relational outcomes (Mergel et al. 2019). Digital transformation therefore has significant impact not only on the accessibility and quality of public services, but also on

the way other public administration functions (such as policy development, regulation and enforcement, etc.) are performed (Dobrolyubova et al. 2019a).

A strong emphasis at the current stage is put on government-as-a-platform solutions (O'Reilly 2011; Styrin et al. 2019) and, consequently, on data-driven governance (World Bank 2018). It is noteworthy that neither platform solutions implemented at the stage of "open government" nor data-centric models based on open data are seen as ultimate results of public administration digitalization. They are just digital transformation stages which are expected to result in complete digitalization and, eventually, "smart government" (Gartner 2017). In academic literature there are also other approaches to staging digital transformation in public administration (see, for instance, Janowski 2015), suggesting that digital transformation is not a one-time event or a project with a clear beginning and end-date but rather a continuous process involving changes both in internal processes and procedures and in the ways public administration communicates with its major beneficiaries. The outcomes of this process are expected to be significant, but no uniform approaches to measuring these outcomes have been implemented so far.

While the digital transformation is an evolving process, the measures used to evaluate such process should also evolve, as the influence of government digitalization on government performance differs, depending on the stage of digital transformation. Such differences are especially important for output-level measures. For instance, at the initial stages of e-government, the indicators, such as the ratio of e-services provided online, are considered relevant. At the more mature stages of digital transformation the effects are different: smart government leads to the replacement of official portals by automatic interactions and, therefore, results in the reduction of types of public services (Dobrolyubova et al. 2019a).

This paper intends to contribute to the current agenda on measuring digital transformation in government and includes (i) a review of current literature on measuring benefits of digital transformation in public administration; (ii) an analysis of existing approaches to measuring the outcomes of government digital transformation; and (iii) an analysis of possibilities for enhancing the existing approaches to measuring government digital transformation.

1. Paper objective

The objective of the paper is to analyze the existing theoretical and practical approaches to measuring outcomes of government digitalization, identify key limitations, and outline possible further directions for designing a comprehensive approach to measuring government digital transformation.

The paper intends to contribute to the existing literature on measuring outcomes of government digital transformation through a systematization of positive and negative effects that digital technology brings about.

2. Measuring outcomes of digital transformation in public administration

2.1 Evaluation methods in public administration

There is impressive literature on general evaluation theory (Christie and Alkin 2008), which inter alia presents a rich menu of methods for evaluating public administration efficiency (Mustafin and Vavrek 2018). However, practical application of evaluations in public administration is limited due to obvious reasons, such as lack of information, regular accountability requirements, and growing pressures for just-in-time monitoring of governance effectiveness and efficiency given the increasing prevalence of performance budgeting, at least in OECD countries (OECD 2019).

The most common approaches used for measuring public sector performance include (i) logic model (or logical framework model); (ii) balanced scorecard; (iii) common assessment framework, and (iv) Moore's strategic value triangle.

The logic model links three main components: inputs (or resources), outputs (or immediate results), and outcomes (ultimate results relevant for external stakeholders). Each component of the framework contributes to the achievement of the next component (inputs allow for the achievement of outputs; outputs contribute to the achievement of outcomes) with risks and assumptions used at each transition stage (i.e. from inputs to outputs and from outputs to outcomes. In some cases, one more level (impact) is used to define the influence of public administration performance on the macro level (i.e. economic, societal, environmental impacts). This approach originated in the US (Williams 2014) and has been extensively used in literature and by practitioners worldwide both at the level of individual programs (projects) and at the level of organizations and policy areas.

The approach based on the balanced scorecard entails measuring a set of perspectives of organizational development, including resources, client orientation, internal processes, innovations (Kaplan and Norton 1992). This approach is applied at the organizational level and has a broad practical application both in the private and public sectors, with favorable results in most cases (Hasan and Chyi 2017), but is not applicable at the policy area or project level.

The common assessment framework (CAF) developed by the European Institute of Public Administration in Maastricht is another instrument for organization-level self-evaluation, specifically designed for public sector institutions. The model includes two large components comprising 9 groups of criteria: enablers (leadership, strategy and planning, people, partnership and resources, and processes) and results (citizen, people, social responsibility, and key performance results).³

³ https://www.eipa.eu/wp-content/uploads/2017/05/CAF_Manual_2013.pdf.

Notably, the CAF model differentiates results by several beneficiary groups including citizen (clients), people (i.e. staff), and society at large.

This model builds upon the two previous models and develops them further. Thus, inputs from the logic model (which most often include financial and human resources) are translated and broadened into a broader group of enablers; outputs are considered results for various groups, outcomes – key performance results. The CAF model also relates to the balances scorecard approach by factoring in resources, client orientation, and internal processes and assuming innovation and learning process based on an evaluation of the results achieved. The model is applied mostly in autonomous public sector organizations, such as education institutions and hospitals and local self-government bodies (Vakalopoulou et al. 2013) but is not directly suitable for evaluating progress in broad public policy areas.

Finally, the strategic value triangle proposed by Moore is based on measuring performance based on the public value, legitimacy, and support, as well as the operational capacity to produce the public value (Moore 2013) and emphasizes the importance of beneficiaries' engagement in evaluation. The framework has been recently further advanced to accommodate the growing role of various stakeholders in co-creation and co-production (Bryson et al. 2017), which is especially relevant in the context of a broad adoption of e-participation approaches (O'Brien et al. 2018).

A review of the above approaches suggests that various approaches to evaluating performance are designed for various purposes and in many cases should be considered complementary to each other and not direct alternatives. While the balanced scorecard and the CAF model perform well at the organizational level, program or policy area levels call for different approaches to performance measurement and evaluation.

Notably, despite the broad menu of evaluation methods, the comparison of actual results with performance targets is still a widespread practice (Alach 2017; Suleimenova et al. 2018) with quantitative methods (i.e. cost-benefit analysis, social return on investment) used for evaluating selected programs (Cordes 2017). Randomized control trial methods of evidence-based policy development are also applied more and more often in the context of program evaluation (Banerjee et al. 2017).

2.2 Theoretic approaches to measuring digital transformation outcomes

Despite the high enthusiasm about the prospects of digital transformation in public administration, there is still no prevailing theoretical approach to measuring the actual benefits this process might provide to all stakeholders concerned. Based on the analysis of the existing literature, three core areas of research interest can be identified.

The first area of research relates to identifying and analyzing possible effects of government digitalization. Given a comparatively novel notion of digital transformation, most literature still focuses on e-government outputs rather than on outcomes of subsequent stages of government digitalization (Bogdanoska Jovanovska 2016; Dečman 2018; Erzhenin 2018). For instance, a recent literature review on public value of e-government suggests that the key dimensions of public value of e-government include improved public services, improved administration (including administrative efficiency, open government, and ethical behavior and professionalism), and improved social value (including improved social value and well-being and improved trust and confidence in government; Twizeyimana and Andersson 2019). Overall, these dimensions fit with an earlier proposed multidimensional model for evaluating e-government proposed by Luna-Reyes and his colleagues, which included the quality of public services, efficiency and productivity, effective programs and policies, transparency and accountability, citizen participation, and adequate regulatory framework in the list of e-government results, which should be differentiated from determinants of e-government (such as quality of information and technological infrastructure) and e-government characteristics, including electronic services, management, democracy and public policies (Luna-Reyes et al. 2012).

The recent review of performance frameworks used for evaluating e-government projects demonstrates that the most common dimensions include ease of use, usefulness, user satisfaction, infrastructure, website maturity, security, user trust, transparency, empowerment, operational efficiency, service quality and information quality (Singh et al. 2020). Thus, the existing performance frameworks comprise various aspects of public administration digitalization, and only some of them deal with outcomes or impacts (i.e. empowerment, transparency, service quality, etc.), while other aspects reflect resources or determinants (i.e. infrastructure, information quality) and characteristics of e-government, i.e. outputs (for instance, usability).

In many performance frameworks the key beneficiaries of e-government are citizens. Therefore, some frameworks are formulated as citizen-centric approaches varying in terms of scope and dimensions accounted for. For instance, the approach developed by D. Špaček and his colleagues is based on benchmarking e-government maturity for a limited list of the most in-demand public services in Central European countries (Špaček et al. 2020). Some studies focus on e-government effects relevant to specific groups of citizens, for instance, persons with disability (Wolniak et al. 2019) and adapt the parameters measured to the needs of such groups.

Another approach proposed in Osman et al. (2014) defined four main components of government digitalization effects on citizens (cost; benefit; risk and opportunity) analogous to the SWOT analysis used for policy formulation. The key proposed data source for measuring these effects is online citizen survey. The recent

OECD research on the impact of government digitalization on citizen well-being suggests that the key aspects of such impact are associated with government being responsive, protective, and trustworthy (Welby 2019).

Notably, some of the existing approaches within this research area focus on the urban context and measuring impacts of smart cities (Shrivastava and Singh 2019; Vila et al. 2018). These approaches emphasize the benefits of municipal service digitalization (i.e. communal services, transport, etc.). It is noteworthy that both the definition of a “smart city” and the role of technological and social determinants in smart cities’ development are subject to academic debate (Hosu and Hosu 2019; Ibănescu et al. 2020).

Overall, the review of this research area suggests that while there is growing interest in evaluating e-government projects and government digitalization overall, several issues seem to be yet unresolved. Firstly, given the evolving process of digital transformation, it is not likely that the outcomes of this process may be measured by the indicators proposed for e-government, which is the first but not the final stage of government digitalization. Secondly, the existing approaches do not consider the distribution of government digitalization outcomes among various stakeholder groups, while the relevance of various value dimensions is different, for instance, for citizens, businesses, and government employees. Thirdly, current approaches tend to focus on the benefits of digitalization but often do not pay enough attention to the costs of government digital transformation and efficiency aspects of the public value achieved (Sidorenko et al. 2019). Fourthly, in most approaches insufficient attention is paid to the issues of government digitalization risks. Even though the existence of such risks is acknowledged in literature (Romanenko 2019), the measurement of government digitalization risks is in practice often limited to the measurement of ICT security (Liu et al. 2013) and does not account for society-related risks.

The second research area is related to a qualitative and quantitative analysis of the data available from international ratings and rankings (Chung 2019; Dias 2019; Orlova et al. 2019; Giannone and Santaniello 2018; Russo 2019), regardless of the fact that this available data often is related to previous stages of implementing digital technologies in public administration (i.e. digitization) and may not fully reflect the outcomes from digital transformation. Indeed, the UN E-government Development Index is significantly driven by dimensions related to ICT infrastructure rather than factors measuring the outcomes of government digitalization (Alkhatri et al. 2017). As confirmed by some recent quantitative research, about 98 percent of the DESI rating, for instance, is determined by the past trends (Stavytskyy et al. 2019).

International indices used to measure government digitalization (such as the UN E-Government Development Index) often concentrate only on e-services and are based on measuring the availability rather than the actual use or quality of such modes of service delivery; they concentrate more on measuring G2C and, to some

extent, G2B interactions and often omit the effects of digitalization for the G2G and G2E dimensions. These indicators often fail to account for emerging technologies (Wahid et al. 2019) and trends in service delivery (Máchová and Lněnička 2015). Though EU DESI indicators are among the most advanced cases for measuring the progress of digitalization in the EU, even in this case the costs of digitalization and potential risks of digital government are not fully accounted for.

Another limitation of the existing international indicators is that they fail to measure the economic and social impact of government digital transformation. While it is assumed that digital technology reduces the costs of businesses and citizens and, indeed, transaction costs of governments related to public service delivery, few countries attempt to measure these gains at least partially (Dobrolyubova et al. 2019a), while international statistics omits the issue completely.

The third area of research deals with the correlation analysis of the role of digital transformation in promoting socio-economic development and improving the quality of governance at large. While some recent research suggests high correlation between governance indicators and e-government development (Durkiewicz and Janowski 2018; Máchová et al. 2018; Tintin et al. 2018), the causality between the two is not confirmed statistically for most public administration indicators, such as WGI governance effectiveness, control of corruption or efficiency of public spending. However, it is statistically confirmed that there is direct causality between e-government development and ease of doing business (Dobrolyubova et al. 2019b).

There are also recent quantitative studies demonstrating a correlation between e-government development on the one hand and entrepreneurship (Abu-Shanab and Osmani 2019) and digital economy development (Zhao et al. 2015) on the other. There is also empirical research confirming a positive correlation between e-government development and international competitiveness (Tintin et al. 2019) and a decrease in shadow economy (Veiga and Rohman 2017). An interesting approach to analyzing and explaining international variation in e-government development in the EU based on variables characterizing infrastructure, R&D investment, access to e-services as well as corruption perceptions was proposed in Androniceanu et al. (2020).

Some experience of individual countries allows to quantify the positive impact government digital transformation may have on business development such as administrative costs reduction (Kästik 2019), but unfortunately there is no cross-country data measuring this important effect.

Overall, the above review suggests that while there is a general understanding supported by some empirical evidence that government digital transformation is positively correlated with economic indicators, such as competitiveness, business activity, and employment, the existing indicators do not allow to measure the impact of such transformation for all potential beneficiaries.

Lack of such national and cross-country data poses several risks. First, there is an obvious financial risk of using public funds for supporting digital transformation which do not yield adequate results. Even international leaders in terms of government digital transformation face failures in some of their initiatives (Omar et al. 2017). Second, there is a risk related to choosing false priorities in government digital transformation and misinterpreting the results achieved. For instance, there is empirical evidence that some potential effects of government digitalization (i.e. quality of e-services delivered) are more important for citizens than other effects, such as improved e-participation and data openness (Ma and Zheng 2017). However, the extent of digitalization of such functions varies both at the national and the cross-national level, hence, a direct comparison may yield misleading results. Third, maintaining the current focus on output-level indicators (i.e. the extent of public services available online or the intensity of digital interactions) does not allow for a timely identification of risks of government digital transformation per se, which may be quite significant even in the most digitally advanced countries (Motzfeldt and Næsborg-Andersen 2018).

2.3 Selected international experience in measuring outcomes of digital transformation in public administration

Digital transformation has become a central trend of public sector reforms with more and more countries adopting government digital transformation strategies, which often include performance targets and call for regular monitoring and evaluation. EU DESI, introduced in 2015, presents one of the most advanced approaches to measuring digital society, including the e-government dimension. The latter includes the data on e-government users; the implementation of pre-filled forms; online service completion (measured for major lifetime events); e-government services for businesses (including transnational issues), and open data. The indicators are measured annually for all EU countries and, for comparison purposes, for some countries outside the EU.⁴

While the introduction of DESI proposed a common basis for rating the progress in digital government development, some authors argue that it also diverted the focus of national digital transformation from the issues not covered by these indicators, such as network neutrality and open-source software (Giannone and Santaniello 2018). Notably, digital government indicators included in DESI do not include other important effects of government digitalization, such as e-participation, the use of advanced digital technologies, such as the Internet of things and artificial intelligence in public administration, and the like.

Also, it should be noted that while DESI includes the measurements of e-services uptake it does not measure public satisfaction with government services digitalization. In countries adopting a digital-by-default principle where users do not

4 https://ec.europa.eu/commission/presscorner/detail/en/MEMO_19_2933.

choose the channel of interactions with the public administration, the correlation between e-service uptake and service delivery satisfaction may not be straightforward.

It is noteworthy that DESI does not measure the economic (efficiency) impact of digital government, neither for the external stakeholders nor to the budget. There are some country-level practices for measuring budget savings from government digitalizing, for instance based on changes in government ICT management in Portugal⁵ and Slovenia.⁶

An alternative international measure has been recently proposed by OECD (OECD 2020). The OECD Digital Government Index (DGI) designed to monitor and support the implementation of the 2014 OECD Recommendation of the Council on Digital Government Strategies comprises 6 dimensions (digital by design, government as a platform, data-driven public sector, open by default, user-driven, and proactiveness) and provides up-to-date data on implementing digital government strategies in OECD member states and some partner countries. Unlike DESI, OECD DGI is focused on the processes implemented in the public administrations to support government digitalization rather than on outcomes of these processes for external stakeholders. For instance, OECD DGI considers whether certain practices, such as measuring service satisfaction or involving citizens in public service design, are in place or not. However, the actual levels of service satisfaction or user involvement have no impact on the index level. Therefore, this measurement effort is useful in terms of mapping various digitalization practices but may be hardly applied for measuring the outcomes and impact of this process.

Another interesting example of measuring government digitalization comes from Singapore's Digital Government Blueprint strategy adopted in 2018. The strategy includes key performance indicators and targets covering three main dimensions: (i) stakeholder satisfaction (which includes citizen and business satisfaction with digital services); (ii) end-to-end digital options (share of services offering e-payment options; services with pre-filled data; services offering digital options for signatures); and (iii) end-to-end transactions (including percentage of transactions completed digitally from end to end and percentage of payments completed electronically).⁷

In the UK and Australia digital performance dashboards were introduced which include the data on citizen satisfaction with public service delivery, transaction costs, service completion and digitalization ratings. Australian experience

5 <http://www.oecd.org/gov/portugal-ICT-rationalization.pdf>.

6 <http://www.oecd.org/governance/digital-government/toolkit/goodpractices/slovenia-p7-3-6-it-reorganization-in-public-administration.pdf>.

7 https://www.smartnation.sg/docs/default-source/default-document-library/dgb_booklet_june2018.pdf.

also demonstrates significant time and financial savings from public administration digitalization.⁸

In Russia, the federal project on digital public administration includes performance indicators measuring the uptake and transformation of public services (share of digital interactions of citizens and businesses with public authorities; the share of digitally transformed priority services; the frequency of refusals for the provision of such services); the proportion of legally binding e-document turnover in the public sector; the level of data harmonization; and the e-document turnover in the framework of the Eurasian Economic Community.⁹ However, the methodologies for measuring these indicators have not been approved and enacted¹⁰, and given the changes in strategic objectives as outlined by the Presidential Decree No. 474 dated 21 July 2020, the set of indicators for measuring digital transformation is being revised with special attention paid to the digital maturity of public administration and the availability of public service delivery in electronic form.

Overall, the above review suggests that with some variation in approaches, the existing practice of measuring public administration digital transformation is focused on evaluating changes in public service delivery (both in terms of e-services uptake and in some cases in terms of citizen satisfaction). The improved efficiency of public savings and time and cost savings for other stakeholders are evaluated for some initiatives, but in many cases, these are one-off evaluations rather than a continuous monitoring process. Digital transformation of other government functions, such as policy development or control and enforcement, are often omitted from evaluations frameworks. No performance indicators for measuring outcomes of government digital transformation for government employees are considered. Finally, neither of the examples reviewed includes indicators aimed at evaluating risks of government digitalization.

The above shortcomings in the practice of measuring outcomes of digital transformation in public administration are, to a significant extent, related to the unresolved issues in theoretical approaches to government digital transformation measurement indicated in section 2.2 of this paper.

3. Possibilities for enhancing the existing approaches to measuring government digital transformation

Developing the existing approaches to measuring government digital transformation calls for resolving the issues identified in the literature review.

8 <https://www.dta.gov.au/about-us/reporting-and-plans/annual-reports/annual-report-2017-18/annual-report-2017-18-2-annual-performance-statement>.

9 <https://digital.gov.ru/uploaded/files/pasport-federalnogo-proekta-tsifrovoe-gosudarstvennoe-upravlenie.pdf>.

10 <https://www.gks.ru/metod/fed-proekt/FP1105.htm>.

Firstly, given the evolving process of digital transformation, measuring its progress should account not only for the fact of implementing digital technologies in public service delivery or regulatory enforcement, but also for the extent of digital maturity. For instance, some online services may entail digital interaction with citizens with manual processing of citizen requests at the end of the public administration, while others may be based on AI-empowered algorithms and, once implemented, require minimal interference on the public administration side. The current approaches to measuring such services are identical, both are delivered online, but the nature of service delivery is quite different. The further deployment of machine-to-machine interaction and the Internet of things, entailing automatic data collection and pro-active service delivery, would require new approaches to measuring public service quality: instead of the current indicators measuring client satisfaction and service result waiting time, other measures, such as system sustainability, data security and service access neutrality, would gain more importance. Addressing these changes calls for designing new performance indicators that would reflect both the complexity of digital solutions (i.e. the use of advanced technologies, such as artificial intelligence, big data processing, blockchain, Internet of things) and the risks related to government digital transformation.

Some elements of government digitalization maturity are partially addressed by the OECD Digital Government Index (OECD 2020). However, this framework covers only some but not all stages of digital maturity. For instance, it covers platform solutions relevant for open government and data-driven digitalization relevant for data-centered government but does not fully account for further digital transformation stages, such as fully digital and smart government (Gartner 2017).

Secondly, government digital transformation impacts various stakeholder groups (i.e. citizens, businesses, government itself, and public servants), while the existing performance measurement approaches are mostly citizen-centric (see for example Osman et al. 2014; Al-Yafi et al. 2016). Even when the business perspective is factored in, the focus is mostly on reducing administrative costs as a critical effect of government digitalization for businesses (Veiga et al. 2016; Kästik 2019). However, the outcomes of public administration digital transformation for businesses go beyond cost optimization and entail, *inter alia*, new business opportunities, better quality of public services, higher transparency and predictability of government regulation.

Measuring the effects of digitalization on government itself is also often limited to reducing transaction costs. While there are quite a few examples where government digital transformation helped to reduce operational costs (Barcevičius et al. 2019), there is also some evidence that implementing digital technologies may become a cost driver in the public sector (Andersen et al. 2012). However, the impact of government digitalization on the way the public administration functions is much broader than just cost optimization. Unleashing the potential of digital tech-

nologies presents new opportunities for enhanced evidence-based policy making and data-driven decisions. As some authors claim, digitalization becomes a tool for attaining strategic policy objectives (Marcovecchio et al. 2019) and enhancing government transparency and accountability (Lindquist and Huse 2017). Such effects of government digitalization should also be factored in when designing performance evaluation frameworks, which would help to account for the effects of government digitalization, not only on public service delivery but also on other types of government functions, including but not limited to dispute resolution (Jeretina 2018), e-voting (Braun Binder et al. 2019), and policy development (Morozov 2018).

Empirical studies suggest that often digital transformation is affected by inertia of government institutions (Hur et al. 2019) and a lack of readiness on the part of the public officials (Nghihalwa and Shava 2018; Kuoppakangas et al. 2019). Therefore, a framework for measuring effects of government digitalization should account for both benefits and risks which public officials face because of digital transformation in public administration. Positive impacts of digital transformation on public servants entail improvements in their skills and competences, better productivity of public officials due to digital transformation and reduced time losses for routine operations, better job satisfaction, and improved effectiveness of human resources management processes.

Thirdly, the literature on measuring the impact of government digitalization tends to focus on positive effects, while factoring in the risks associated with digital transformation is equally if not more important.

Such risks, highlighted by the experience of rapid digitalization caused by the 2020 COVID-19 pandemic, range from ICT systems sustainability to security issues vital in the context when non-digital options for interactions with government and the public sector at large were unavailable or strictly limited. The rapid switch from conventional to digital-only interaction in public service delivery highlighted the long-known but still unresolved problem of the digital divide (Dečman 2017) and additional costs needed for digital interaction, for instance in online learning (Dhawan 2020).

Another major risk group is related to ethical issues and privacy concerns. As highlighted in Rowe (2020) the governments around the globe faced a privacy paradox. To achieve the short-term objective and protect the public from risks, many countries introduced digital solutions for contact tracing and enforcing quarantine measures. However, these measures spurred significant academic debate (Gasser et al. 2020) and created a basis for long-term concerns and may have affected digital trust.

The issue of personal data protection in promoting new digital technologies in public administration is equally important for the advanced countries context (see for instance Akkaya et al. 2019; Navas and Beltran 2019) and for transition economies (Záklasník and Putnová 2019; Zhang and Chen 2019). However, the existing

approaches to measuring this risk are limited to selected country examples (Yuzhakov et al. 2020), while cross-country data is limited to the indicator on the share of individuals refraining from digital interactions with the public administration, which is not an option in many countries which have implemented a digital-by-default approach in public service delivery.

It is noteworthy that the risks of government digital transformation are not limited to misuse of personal data and privacy concerns. Some early experiments in using artificial intelligence for public service delivery raise concerns related to high risks of discrimination and lack of transparency in such digital decision making (Kuziemski and Misuraca 2020). Therefore, using citizen perception surveys for measuring satisfaction with access to and quality of public services by social groups (with special attention to potentially vulnerable groups, such as youth, unemployed, persons with disabilities, and others) seems highly relevant for a timely detection of possible exclusion or discrimination based on implementing new digital technologies. This data can be complemented by “traditional” digital divide indicators characterizing variation in access to and skills in digital technologies which are already widely applied in practice.

While most of the above risks are faced by citizens, other beneficiary groups also confront risks related to government digital transformation. These risks range from additional costs related to digital interaction to digital crime and excessive dependence on outsourcing digital solutions (Motzfeldt and Næsborg-Andersen 2018) and civil service employment stability concerns because of digitalization of government functions. Rapid digitalization calls for acquiring new technical and e-management skills by the public officials, which would help to overcome the challenges related to virtual communication and structures (Van Wart et al. 2016), once again highlighted by the COVID-19 pandemic experience (Toleikienė et al. 2020). The risk related to digital trust to government on behalf of businesses is also worth accounting for (Pinem et al. 2018).

To systematize the existing approaches to measuring government digital transformation impacts and illustrate the possible ways of overcoming the limitation discussed above, it seems useful to classify the positive effects and risks of digital transformation in public administration by types of functions and beneficiary groups (Table 1). Such classification could be helpful for developing performance indicators both for public administration as a whole and for individual public authorities engaged in performing certain types of government functions (i.e. public policy development and regulation, public service delivery, law enforcement).

Table 1
Effects of digital transformation in public administration for each beneficiary group and type of function

Types of functions	Beneficiary Group			
	Citizens	Businesses	Government	Public officials
Public policy development and regulation	<ul style="list-style-type: none"> improved transparency and accountability improved public participation in governance and policy development 	<ul style="list-style-type: none"> improved predictability and transparency of public policies and regulation 	<ul style="list-style-type: none"> improved decision-making quality based on actual and trustworthy data 	<ul style="list-style-type: none"> improved skills and competences of public officials, readiness to digital transformation improved effectiveness and productivity of public officials due to digital transformation, better job satisfaction improved effectiveness of human resources management processes, readiness to digital transformation
Public service delivery	<ul style="list-style-type: none"> improved access to public services improved quality of public service delivery 	<ul style="list-style-type: none"> new business opportunities (i.e. government platforms, open data, etc.) improved quality of public services for businesses 	<ul style="list-style-type: none"> improved coordination of public authorities improved efficiency of public expenditure based on increased competition and enhanced transparency of procurement procedures 	
Law enforcement	<ul style="list-style-type: none"> better protection of lawful rights and interests of citizens (by introducing risk-based enforcement, etc.) 	<ul style="list-style-type: none"> better protection of lawful rights and interests of businesses 		
Transaction costs (all functions)	<ul style="list-style-type: none"> reduced time and financial costs related to interaction with public authorities 	<ul style="list-style-type: none"> reduced administrative costs related to application for public services, inspection, and enforcement activities 	<ul style="list-style-type: none"> reduced administrative costs related to execution of public functions and public service delivery 	<ul style="list-style-type: none"> reduced time losses for routine operations
Digital transformation risks	<ul style="list-style-type: none"> violation of human rights, including privacy discrimination of vulnerable groups digital-based fraud additional costs related to digital interaction with the government 	<ul style="list-style-type: none"> digital crime (cyberattacks, information leakage) additional costs related to digital interaction with the government 	<ul style="list-style-type: none"> insufficient security and sustainability of government information systems (data loss/leakages/unavailability of public services) loss (inefficient use) of public funds due to low-quality digital solutions excessive dependence on outsourcing increased expenditures on information systems operation and maintenance 	<ul style="list-style-type: none"> risks of job loss due to automation of processes and procedures time and financial costs related to acquiring and developing digital skills

Source: author

The proposed classification of government digital transformation effects may be used as a checklist for developing individual performance frameworks at the organizational level of public administration and may be also used for defining benefits and risks for individual digitalization initiatives in the public sector. For instance, such an approach could help resolve some of the issues which were encountered in business cases development practices (Howes and Kidney Bishop 2018).

It is noteworthy that measuring all the effects and risks listed in Table 1 would require additional data. In most cases, such data could be obtained from administrative sources, which is a natural solution given the transition to data-driven public administration. However, in some cases (especially for measuring digital transformation risks) additional regular monitoring efforts might be required. Although these efforts would call for additional resources, given the magnitude of funds which are being spent and are planned to be used for government digital transformation, such additional investment appears to be rational.

In the longer run, developing a cross-country data collection framework could be considered, especially for measuring the dimensions related to government digitalization risks and costs, such as transaction costs and digital trust to public administration.

4. Conclusions and recommendations

The review of international literature suggests that despite significant attention paid to measuring digital transformation in public administration, many issues related to such measurement are still to be resolved. Thus, the current approaches, building mostly on the e-government stage of digital government transformation fail to differentiate the complexity of digital technologies employed, are not comprehensive in terms of types of government functions which are digitalized. The existing approaches do not reflect the impact of government digitalization on all stakeholders and tend to focus on positive effects of digital transformation rather than risks of the process.

Such imbalances lead to the fact that government digital transformation is treated as a goal in itself rather than a means for raising effectiveness and efficiency of public administration. However, neglecting possible negative impacts of government digitalization may lead to the situation when some short-term efficiency improvements come at the cost of longer-term effectiveness gains. For instance, short-term digital solutions related to contact tracing and implementing containment regulations during the 2020 COVID-19 outbreaks may lead to longer-term deterioration in protecting privacy and, therefore, undermine digital trust to government. Inadequate attention to protecting personal data from fraud risks may result in reluctance to engage in digital communication and use e-identity: this effect is already noted in Russia where, after several cases of fraud with digital identity in

property registration, citizens officially ban any electronic transactions with their property and prefer in-person application for relevant public services. Reluctance to adopt digital public service delivery was noted in some other countries (cf. Madsen et al. 2019).

Therefore, successful digital transformation calls for developing and implementing a balanced measurement framework reflecting the influence of digitalization on the effectiveness and efficiency of public administration. Such a framework should comprise all types of core government functions and processes and therefore capture the effects of digital transformation not only in the public service delivery area but also in other types of public administration functions. It should outline effects (outcomes) for all beneficiary groups and allow for balancing the interests and benefits from digitalization for all parties involved, on the one hand, and costs and risks of digitalization, on the other.

In this paper we proposed an initial classification of effects and risks of digital transformation of public administration by function and stakeholder group. This classification could become a basis for developing a new performance framework for government digital transformation and could also be used as a checklist for identifying impacts of digital transformation at the organizational level and at the level of individual ICT initiatives.

The analysis performed in this paper offers several possible areas for future research. The first area entails developing and piloting a government digital transformation framework based on the identified positive effects and risks. Another promising area of the research may entail further disaggregation of the proposed framework for specific beneficiary sub-groups. For instance, some additional specific positive outcomes (and, indeed, risks) may be relevant to specific industry sectors or social groups. Thirdly, developing adequate measurement approaches for monitoring the extent of digital maturity in the public administration may have both theoretical significance and broad practical application.

References

- Abu-Shanab, E. A. and M. Osmani. 2019. "E-Government as a Tool for Improving Entrepreneurship." *International Journal of Electronic Government Research* 15(1), 36–46. doi:10.4018/IJEGR.2019010103.
- Akkaya, C., M. Jakob and H. Krcmar. 2019. "Potential Use of Citizen Accounts on e-Government Portals." Paper presented at the Proceedings of the European Conference on e-Government, ECEG, 2019-October 1–9 October 2019. doi:10.34190/ECDG.19.004.
- Alach, Z. 2017. "Towards a Standard Conceptual Typology of Public Sector Performance Measurement." *Kotuitui* 12(1), 56–69.

- Alkhatiri, N. S., N. Zaki, E. Mohammed and M. Shallal. 2017. "The Use of Data Mining Techniques to Predict the Ranking of E-Government Services." Paper presented at the Proceedings of the 2016 12th International Conference on Innovations in Information Technology, IIT 2016. doi:10.1109/INNOVATIONS.2016.7880047.
- Al-Yafi, K., N. M. Hindi and I. H. Osman. 2016. "A User-Centric Evaluation of e-Government Services in the GCC Region: Case of State of Qatar." *International Journal of Electronic Government Research* 12(4), 15–34. doi:10.4018/IJEGR.2016100102.
- Andersen, K. N., R. Medaglia and H. Z. Henriksen. 2012. "Social Media in Public Health Care: Impact Domain Propositions." *Government Information Quarterly* 29(4), 462–469.
- Androniceanu, A., J. Kinnunen and I. Georgescu. 2020. "E-Government Clusters in the EU Based on the Gaussian Mixture Models." *Administratie si Management Public* 35, 6–20. doi:10.24818/amp/2020.35–01.
- Banerjee, A., R. Banerji, J. Berry, E. Duflo, H. Kannan, S. Mukerji, M. Shotland and M. Walton. 2017. "From Proof of Concept to Scalable Policies: Challenges and Solutions, with an Application." *Journal of Economic Perspectives* 31(4), 73–102.
- Bannister, F. and R. Connolly. 2014. "ICT, Public Values and Transformative Government: A Framework and Programme for Research." *Government Information Quarterly* 31(1), 119–128.
- Barcevičius, E., G. Cibaitė, C. Codagnone, V. Gineikytė, L. Klimavičiūtė, G. Liva, L. Matulevič, G. Misuraca and I. Vanini. 2019. *Exploring Digital Government Transformation in the EU: Analysis of the State of the Art and Review of Literature*. EUR 29987 EN, Publications Office of the European Union, Luxembourg.
- Bogdanoska Jovanovska, M. 2016. "Demarcation of the Field of E-Government Assessment." *Transylvanian Review of Administrative Sciences* 12(48), 19–36.
- Braun Binder, N., R. Krimmer, G. Wenda and D.-H. Fischer. 2019. "International Standards and ICT Projects in Public Administration: Introducing Electronic Voting in Norway, Estonia and Switzerland Compared." *Halduskultuur: The Estonian Journal of Administrative Culture and Digital Governance* 19(2), 8–218.
- Bryson, J., A. Sancino, J. Benington and E. Sørensen. 2017. "Towards a Multi-Actor Theory of Public Value Co-Creation." *Public Management Review* 19(5), 640–654. doi:10.1080/14719037.2016.1192164.
- Christie, C. A. and M. C. Alkin. 2008. "Evaluation Theory Tree Re-Examined." *Studies in Educational Evaluation* 34(3), 131–135.

- Chung, C. S. 2019. "Analysis on the 2018 UN E-Government Survey." *Journal of Advanced Research in Dynamical and Control Systems* 11(7 Special Issue), 1242–1252.
- Cordella, A. and A. Paletti. 2018. "ICTs and Value Creation in Public Sector: Manufacturing Logic vs Service Logic." *Information Polity* 23(2), 1–17.
- Cordes, J. J. 2017. "Using Cost-Benefit Analysis and Social Return on Investment to Evaluate the Impact of Social Enterprise: Promises, Implementation, and Limitations." *Evaluation and Program Planning* 64, 98–104.
- Dečman, M. 2017. "A Model of Digital Inequality in the Knowledge Society: The Case of Slovenia." *International Public Administration Review* 15(2), 11–39.
- Dečman, M. 2018. "The Analysis of E-Government Services Adoption and Use in Slovenian Information Society between 2014 and 2017." *Central European Public Administration Review* 16(2), 193–215.
- Dhawan S. 2020. "Online Learning: A Panacea in the Time of COVID-19 Crisis." *Journal of Educational Technology Systems* 49(1), 5–22. doi:10.1177/0047239520934018.
- Dias, G. P. 2019. "Policy Matters? An Analysis of Outliers in the UN e-Government Index." Paper presented at the Proceedings of the European Conference on e-Government, ECEG, 10–18 October 2019. doi:10.34190/ECDG.19.005.
- Dobrolyubova E., E. Klochkova and O. Alexandrov. 2019b. "Digitalization and Effective Government: What Is the Cause and What Is the Effect?" In D. Alexandrov, A. Boukhanovsky, A. Chugunov, Y. Kabanov, O. Koltsova and I. Musabirov (eds). *Digital Transformation and Global Society*. DTGS 2019. Communications in Computer and Information Science 1038. Cham: Springer, 55–67. doi:10.1007/978-3-030-37858-5_5.
- Dobrolyubova, E. I., V. N. Yuzhakov, A. A. Yefremov, E. N. Klochkova, E. V. Talapina and Ya. Yu. Startsev. 2019a. *Cifrovoe budushhee gosudarstvennogo upravleniya po rezul'tatam* [Digital Future of Performance Management]. Moscow: Delo (in Russian).
- Durkiewicz, J. and T. Janowski. 2018. "Is Digitalization Improving Governance Quality? Correlating Analog and Digital Benchmarks." In R. Bouzas-Lorenzo and A. C. Ramos (eds.). *Proceedings of the 18th European Conference on Digital Government ECDG 2018*. Reading: Academic Conferences and Publishing International Limited, 48–56.
- Erzhenin, R. V. 2018. "Elektronnoe pravitelstvo Rossii: Obzor nauchnykh publikatsiy i issledovaniy" [Russian E-Government: Review of Scientific Publications and Research]. *Public Administration Issues* 3, 205–228 (in Russian).

- Gartner. 2017. "5 Levels of Digital Government Maturity." 6 November 2017. Available at <https://www.gartner.com/smarterwithgartner/5-levels-of-digital-government-maturity/> (last accessed 22 October 2020).
- Gasser, U., M. Ienca, J. Scheibner, J. Sleight and E. Vayena. 2020. "Digital Tools against COVID-19: Taxonomy, Ethical Challenges, and Navigation Aid." *Lancet Digital Health* 2(8), e425–e434. doi:10.1016/S2589-7500(20)30137-0.
- Giannone, D. and M. Santaniello. 2018. "Governance by Indicators: The Case of the Digital Agenda for Europe." *Information Communication and Society* 22(13), 1889–1902. doi:10.1080/1369118X.2018.1469655.
- Hasan, R. U. and T. M. Chyi. 2017. "Practical Application of Balanced Scorecard: A Literature Review." *Journal of Strategy and Performance Management* 5(3), 87–103.
- Heidelberg, C. A. 2009. "Citizens, not Consumers." In V. Weerakkody, M. Janssen and Y. Dwivedi (eds). *Handbook of Research on ICT-Enabled Transformational Government: A Global Perspective*. Hershey: IGI Global, 51–71.
- Hosu, R. and I. Hosu. 2019. "'SMART' in Between People and the City." *Transylvanian Review of Administrative Sciences* 15, 5–20.
- Howes, S. and T. Kidney Bishop. 2018. *The Hidden Obstacles to Government Digital Transformation*. Institute for Government. Available at https://www.instituteforgovernment.org.uk/sites/default/files/publications/Digital_Transformation_final_WEB.pdf (last accessed 2 December 2020).
- Hur, J., W. Cho, G. Lee and S. H. Bickerton. 2019. "The 'Smart Work' Myth: How Bureaucratic Inertia and Workplace Culture Stymied Digital Transformation in the Relocation of South Korea's Capital." *Asian Studies Review* 43(4), 691–709. doi:10.1080/10357823.2019.1663786.
- Ibănescu, B., A. Bănică, M. Eva and A. Cehan. 2020. "The Puzzling Concept of Smart City in Central and Eastern Europe: A Literature Review Designed for Policy Development." *Transylvanian Review of Administrative Sciences* 16(61), 70–87.
- Janowski, T. 2015. "Digital Government Evolution: From Transformation to Contextualization." *Government Information Quarterly* 32(3), 221–236. doi:10.1016/j.giq.2015.07.001.
- Janssen, M. and E. Estevez. 2013. "Lean Government and Platform-Based Governance: Doing More with Less." *Government Information Quarterly* 30, 1–8.
- Jeretina, U. 2018. "Consumer Online Dispute Resolution (ODR): A Mechanism for Innovative E-governance in EU." *Central European Public Administration Review* 16(2), 45–67.

- Kaplan, R. S. and D. P. Norton. 1992. "The Balanced Scorecard: Measures that Drive Performance." *Harvard Business Review* 70(1), 71–79.
- Kästik, T. 2019. "The Impact of Digital Governance on the Business Environment: The Case of Estonian Tax and Customs Board." Paper presented at the *ACM International Conference Proceeding Series, Part F148155*, 472–474. doi:10.1145/3326365.3326430.
- Kuoppakangas, P., T. Kinder, J. Stenvall, I. Laitinen, O. Ruuskanen and P. Rannisto. 2019. "Examining the Core Dilemmas Hindering Big Data-Related Transformations in Public-Sector Organisations." *NISPAcee Journal of Public Administration and Policy* 12(2), 131–156. doi:10.2478/nispa-2019-0017.
- Kuziemski, M. and G. Misuraca. 2020. "AI Governance in the Public Sector: Three Tales from the Frontiers of Automated Decision-Making in Democratic Settings." *Telecommunications Policy* 44(6). doi:10.1016/j.telpol.2020.101976.
- Lindquist, E. A. and I. Huse. 2017. "Accountability and Monitoring Government in the Digital Era: Promise, Realism and Research for Digital Era Governance." *Canadian Public Administration* 60, 627–656. doi:10.1111/capa.12243.
- Liu, X., Y. Shen, G. Zhang and S. Li. 2013. "The e-Government System Risk Assessment Model Based on Dynamic Threat and Fuzzy Neural Network." Paper presented at the Proceedings of 2013 5th IEEE International Conference on Broadband Network and Multimedia Technology, IEEE IC-BNMT 2013, 75–79. doi:10.1109/ICBNMT.2013.6823918.
- Luna-Reyes L. F. 2017. "Opportunities and Challenges for Digital Governance in a World of Digital Participation." *Information Polity*, 22(2–3), 197–205. doi:10.3233/IP-170408.
- Luna-Reyes L. F., J. R. Gil-Garcia and G. Romero. 2012. "Towards a Multidimensional Model for Evaluating Electronic Government: Proposing a More Comprehensive and Integrative Perspective." *Government Information Quarterly* 29(3), 324–334.
- Ma, L. and Y. Zheng. 2017. "National e-Government Performance and Citizen Satisfaction: A Multilevel Analysis across European Countries." *International Review of Administrative Sciences* 85(3), 506–526. doi:10.1177/0020852317703691.
- Máchová, R. and M. Lněnička. 2015. "Reframing E-Government Development Indices with Respect to New Trends in ICT." *Review of Economic Perspectives* 15(4), 383–411.
- Máchová, R., J. Volejníková and M. Lněnička. 2018. "Impact of E-Government Development on the Level of Corruption: Measuring the Effects of Related Indices in Time and Dimensions." *Review of Economic Perspectives* 18(2), 99–121. doi:10.2478/revecp-2018–0006.

- Madsen, C. Ø., S. Hofmann and W. Pieterston. 2019. "Channel Choice Complications: Exploring the Multiplex Nature of Citizens' Channel Choices." doi:10.1007/978-3-030-27325-5_11.
- Marcovecchio, I., M. Thinyane, E. Estevez and T. Janowski. 2019. "Digital Government as Implementation Means for Sustainable Development Goals." *International Journal of Public Administration in the Digital Age* 6(3), 1–22.
- Margetts, H. and P. Dunleavy. 2013. "The Second Wave of Digital-Era Governance: A Quasi-Paradigm for Government on the Web." *Philosophical Transactions of the Royal Society* 371(1987).
- Martin, A. 2008. "Digital Literacy and the 'Digital Society.'" In C. Lankshear and M. Knobel (eds). *Digital Literacies Concepts Policies Practices*. New York: Peter Lang Publishing, 151–176.
- Mergel, I., N. Edelmann and N. Haug. 2019. "Defining Digital Transformation: Results from Expert Interviews." *Government Information Quarterly* 36(4). doi:10.1016/j.giq.2019.06.002.
- Moore M. H. 2013. *Recognizing Public Value*. Cambridge, Mass.: Harvard University Press.
- Morozov, A. N. 2018. "Alternativnye istochniki statisticheskoy informatsii kak osnova priniatiya politicheskikh resheniy" [Alternative Sources of Statistical Information as the Basis for Political Decision Making]. *Public Administration Issues* 2, 50–70 (in Russian).
- Motzfeldt, H. M. and A. Næsborg-Andersen. 2018. "Digitalisation and the (Unintended) Illegal Outsourcing of Legislative and Administrative Power in Denmark." In R. Bouzas-Lorenzo and A. C. Ramos (eds.). *Proceedings of the 18th European Conference on Digital Government ECDG 2018*. Reading: Academic Conferences and Publishing International Limited, 135–141.
- Mustafin, A. N. and R. Vavrek. 2018. "Literary Review of Methods of Efficiency Evaluation in Public Sector." *Journal of Social Sciences Research* 2018 (Special Issue 5), 170–174. doi:10.32861/jssr.spi5.170.174.
- Navas, J. and M. Beltrán. 2019. "Potential Impacts in Citizens' Privacy of Using Federated Identity Management to Offer e-Government Services." Paper presented at the ICETE 2019. *Proceedings of the 16th International Joint Conference on e-Business and Telecommunications* 2, 350–355.
- Nghihalwa, E. and F. B. Shava. 2018. "An Assessment of Cloud Computing Readiness in the Namibian Government's Information Technology Departments." Paper presented at the 19th IEEE Mediterranean Electrotechnical Conference, MELECON 2018. *Proceedings*, 92–97. doi:10.1109/MELCON.2018.8379074.

- O'Brien, A., W. Golden and M. Scott. 2018. "Public Values on the Cusp of Change, the Journey from Consultation to Collaboration." Paper presented at the ACM International Conference Proceeding Series, 685–686. doi:10.1145/3209415.3209450.
- OECD. 2019. *Budgeting and Public Expenditures in OECD Countries 2019*. Paris: OECD Publishing. doi:10.1787/9789264307957-en.
- OECD. 2020. "Digital Government Index: 2019 Results." *OECD Public Governance Policy Papers* 3. Paris: OECD Publishing. doi:10.1787/4de9f5bb-en.
- Omar, A., V. Weerakkody and U. Sivarajah. 2017. "Digitally Enabled Service Transformation in UK Public Sector: A Case Analysis of Universal Credit." *International Journal of Information Management* 37(4), 350–356.
- O'Reilly, T. 2011. "Government as a Platform." *Innovations: Technology, Governance, Globalization* 6(1), 13–40.
- Orlova, N., I. Mokhova, O. Diegtiar and O. Khomutenko. 2019. "Methodology of the Electronic Government Evaluation of the European Union Countries Based on Taksonometric Method." Paper presented at the *Proceedings of the 33rd International Business Information Management Association Conference, IBIMA 2019: Education Excellence and Innovation Management through Vision 2020*, 505–517.
- Osman, I. H., A. L. Anouze, Z. Irani, B. Al-Ayoubi, H. Lee, A. Balc and V. Weerakkody. 2014. "COBRA Framework to Evaluate e-Government Services: A Citizen-Centric Perspective." *Government Information Quarterly* 31(2), 243–256. doi:10.1016/j.giq.2013.10.009.
- Pinem, A. A., I. M. Immanuella, A. N. Hidayanto, K. Phusavat and Meyliana. 2018. "Trust and its Impact towards Continuance of Use in Government-to-Business Online Service." *Transforming Government: People, Process and Policy* 12(3–4), 265–285. doi:10.1108/TG-02-2018-0008.
- Reis, J., M. Amorim, N. Melao and P. Matos. 2018. "Digital Transformation: A Literature Review and Guidelines for Future Research." In Á. Rocha, H. Adeli, L. P. Reis and S. Costanzo (eds). *Trends and Advances in Information Systems and Technologies*. WorldCIST'18 2018: Advances in Intelligent Systems and Computing 745. Cham: Springer, 411–421.
- Romanenko, V. V. 2019. "Use of Information and Communication Technologies for Obtaining Public Social Services in Russia." *Lecture Notes in Computer Science* 11938 LNCS, 109–120.
- Rowe, F. 2020. "Contact Tracing Apps and Values Dilemmas: A Privacy Paradox in a Neo-Liberal World." *International Journal of Information Management* 55. doi:10.1016/j.ijinfomgt.2020.102178.

- Russo, V. 2019. "Digital Economy and Society Index (DESI): European Guidelines and Empirical Applications on the Territory." In J. L. S. Sánchez-Serrano, F. Maturo and Š. Hošková-Mayerová (eds). *Qualitative and Quantitative Models in Socio-Economic Systems and Social Work*. Studies in Systems, Decision and Control. Cham: Springer, 427–442. doi:10.1007/978-3-030-18593-0_31.
- Shrivastava, V. P. and J. Singh. 2019. "Review of Performance Indicators of Smart Cities in India: Ease of Living Index: A Case of Jabalpur Smart City." *International Journal of Scientific and Technology Research* 8(10), 2590–2600.
- Sidorenko, E. L., I. N. Bartsits and Z. I. Khisamova. 2019. "The Efficiency of Digital Public Administration Assessing: Theoretical and Applied Aspects." *Public Administration Issues* 2019(2), 93–114.
- Singh, H., P. Grover, A. K. Kar and P. V. Ilavarasan. 2020. "Review of Performance Assessment Frameworks of e-Government Projects." *Transforming Government: People, Process and Policy* 14(1), 31–64. doi:10.1108/TG-02-2019-0011.
- Špaček, D., M. Csótó and N. Urs. 2020. "Questioning the Real Citizen-Centricity of e-Government Development: Digitalization of G2C Services in Selected CEE Countries." *NISPACEE Journal of Public Administration and Policy* 13(1), 213–243.
- Stavytskyy, A., G. Kharlamova and E. A. Stoica. 2019. "The Analysis of the Digital Economy and Society Index in the EU." *Baltic Journal of European Studies* 9(3), 245–261. doi:10.1515/bjes-2019-0032.
- Styrin, E. M., N. E. Dmitrieva and L. H. Sinyatullina. 2019. "Gosudarstvennye tsifrovye platformy: Ot kontsepta k realizatsii" [Government Digital Platform: From Concept to Implementation]. *Public Administration Issues* 4, 31–60 (in Russian).
- Suleimenova, G., E. Kapoguzov, N. Kabizhan and M. Kadyrova. 2018. "Performance Evaluation of the Government Agencies of Kazakhstan." *NISPACEE Journal of Public Administration and Policy* 11(2), 171–198. doi:10.2478/nispa-2018-0018.
- Tintin, R., P. Altamirano, C. Chavez and L. Tintin. 2019. "Could the Development of On-Line Services Contribute to Global Competitiveness?" Paper presented at the WMSCI 2019: 23rd World Multi-Conference on Systemics, Cybernetics and Informatics. *Proceedings* 1, 31–35.
- Tintin, R. A., C. C. Chavez, J. P. Altamirano and L. M. Tintin. 2018. "Could E-Government Development Contribute to Reduce Corruption Globally?" Paper presented at the 2018 5th International Conference on eDemocracy and eGovernment, ICEDEG 2018, 187–194. doi:10.1109/ICEDEG.2018.8372366.

- Toleikienė, R., I. Rybnikova and V. Juknevičienė. 2020. "Whether and how does the Crisis-Induced Situation Change e-Leadership in the Public Sector? Evidence from Lithuanian Public Administration." *Transylvanian Review of Administrative Sciences* 16 (SI), 149–166.
- Twizeyimana, J. D. and A. Andersson. 2019. "The Public Value of E-Government: A Literature Review." *Government Information Quarterly* 36(2), 167–178.
- Vakalopoulou, M. A., G. Tsiotras and K. Gotzamani. 2013. "Implementing CAF in Public Administration: Best Practices in Europe – Obstacles and Challenges." *Benchmarking* 20(6), 744–764. doi:10.1108/BIJ-10-2011-0080.
- Van Wart, M., A. Roman and S. Pierce. 2016. "The Rise and Effect of Virtual Modalities and Functions on Organizational Leadership: Tracing Conceptual Boundaries Along the E-Management and E-Leadership Continuum." *Transylvanian Review of Administrative Sciences* 12 (SI), 102–122.
- Veiga, L., T. Janowski and L. Soares Barbosa. 2016. "Digital Government and Administrative Burden Reduction." Paper presented at the *ACM International Conference Proceeding Series, 1–3 March 2016*, 323–326. doi:10.1145/2910019.2910107.
- Veiga, L. and I. K. Rohman. 2017. "E-Government and the Shadow Economy: Evidence from across the Globe." In *Electronic Government: 16th IFIP WG 8.5 International Conference, EGOV 2017, St. Petersburg, Russia, 4–7 September 2017, Proceedings*. Lecture Notes in Computer Science 10428 doi:10.1007/978-3-319-64677-0_9.
- Vila, R. A., E. Estevez and P. R. Fillottrani. 2018. "The Design and Use of Dashboards for Driving Decision-Making in the Public Sector." Paper presented at the *ACM International Conference Proceeding Series*, 382–388. doi:10.1145/3209415.3209467.
- Vintar, M. 2010. "Current and Future Public Management Reforms: Does Technology Matter?" *NISPAcee Journal of Public Administration and Policy* 3(2), 13–30.
- Vuksić, V., L. Ivančić and D. S. Vugec. 2018. "A Preliminary Literature Review of Digital Transformation Case Studies." *International Journal of Computer and Information Engineering* 12(9), 737–742.
- Wahid, J. A., L. Shi, Y. Tao, L. Wei and K. Saleem. 2019. "Incorporation of Social Media Indicator in e-Government Index." Paper presented at the *ACM International Conference Proceeding Series*, 201–209. doi:10.1145/3369985.3370026.
- Welby, B. 2019. "The Impact of Digital Government on Citizen Well-Being." *OECD Working Papers on Public Governance* 32. Paris: OECD Publishing, doi:10.1787/24bac82f-en.

- Westerman, G., J. C. Calmé, D. Bonnet, P. Ferraris and A. McAfee. 2011. *Digital Transformation: A Roadmap for Billion-Dollar Organizations*. MIT Sloan Management, MIT Center for Digital Business and Capgemini Consulting.
- Williams, D. 2014. "The Evolution of the Performance Model from Black Box to the Logic Model Through Systems Thinking." *International Journal of Public Administration* 37(13), 932–944.
- Wolniak, R., B. Skotnicka-Zasadzień and M. Zasadzień. 2019. "Problems of the Functioning of E-Administration in the Silesian Region of Poland from the Perspective of a Person with Disabilities." *Transylvanian Review of Administrative Sciences* 15(57), 137–155.
- World Bank. 2016. *Digital Dividends: World Development Report*. Washington, D.C.: World Bank.
- World Bank. 2018. *Russia Digital Economy Report. Competition in the Digital Age: Implications for the Russian Federation*. Available at <https://openknowledge.worldbank.org/bitstream/handle/10986/30584/AUS0000158-WP-REVISED-P160805-PUBLIC-Disclosed-10-15-2018.pdf?sequence=1&isAllowed=y> (last accessed 5 October 2020).
- Yuzhakov, V. N., E. I. Dobrolyubova, A. N. Pokida, N. V. Zybunovskaya and E. V. Maslennikova. 2020. *Evaluation of Dynamics of Government Control and Supervision Activities Performance from Citizen Perspective*. Moscow: PANEP, Delo Publishing (in Russian).
- Záklasník, M. and A. Putnová. 2019. "Digital Society: Opportunity or threat? Case Studies of Japan and the Czech Republic." *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* 67(4), 1085–1095.
- Zhang, L. and S. Chen. 2019. "China's Digital Economy: Opportunities and Risks." *International Organisations Research Journal* 14(2), 275–303.
- Zhao, F., J. Wallis and M. Singh. 2015. "E-Government Development and the Digital Economy: A Reciprocal Relationship." *Internet Research* 25(5), 734–766. doi:10.1108/IntR-02-2014-0055.