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Editorial

Digital government transformation in turbulent times: Responses, challenges, and future direction



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ABSTRACT

We are living in turbulent times, with the threats of COVID-19 and related social conflicts. Digital transformation is not an option but a necessity for governments to respond to these crises. It has become imperative for governments worldwide to enhance their capacity to strategically use emerging digital technologies and develop innovative digital public services to confront and overcome the pandemic. With the rapid development of digital technologies, digital government transformation (DGT) has been legitimated in response to the pandemic, contributing to innovative efficacy, but it also has created a set of challenges, dilemmas, paradoxes, and ambiguities. This special issue's primary motive is to comprehensively discuss the promises and challenges DGT presents. It focuses on the nature of the problems and the dilemmatic situation in which to use the technologies. Furthermore, it covers government capacity and policy implications for managerial and institutional reforms to respond to the threats and the uncertainty caused by disruptive digitalization in many countries. To stimulate discussion of the theme of this special issue, this editorial note provides an overview of previous literature on DGT as a controlling measure of the pandemic and the future direction of research and practice on DGT.

1. Introduction

We are living in a turbulent time, with multiple threats such as COVID-19 and related social and political conflicts. The pandemic has posed severe challenges to governments and their citizens worldwide (Whitelaw, Mamas, Topol, & Van Spall, 2020). Globally, there have been more than 446 million confirmed cases and 6 million deaths as of March 10, 2022 (WHO, 2022). The pandemic has stalled local businesses and affected public health, with many experiencing stress, anxiety, and depression (Khan et al., 2020; Planchuelo-Gómez, Odriozola-González, & de Luis-García, 2020). Even those who are not infected confront challenges in all aspects of life, such as job loss, job changes, relationship strain, and changes in childcare and social life (Venkatesh, 2020).

The pandemic tends to intensify social and political conflicts by exacerbating countries' economic and humanitarian crises, even though all levels of government have worked tirelessly to contain the spread of COVID-19 and its variants such as Delta and Omicron. In the US, for example, hate crimes against Asian people increased by 70% in 2020 compared to 2019. According to the FBI, this surge occurred in conjunction with the outbreak of the pandemic, which some racists have unjustly blamed Asians due to the virus's origins in China. Additionally, the number of hate crimes targeting black people increased nearly 40% in 2020 compared to 2019.¹

This pandemic and the related turbulences have compelled us into the era of the "new normal." Everything appears to be very different

from what we are accustomed to. In this situation, digital transformation is not an option but a necessity for governments to respond to these crises (Fletcher & Griffiths, 2020). Over the past few years, we have witnessed digital government transformation (DGT) has been widely swept through the pandemic. Therefore, it has become imperative for governments worldwide to enhance their capacity to strategically use new digital technologies and develop innovative digital public services to confront and overcome the pandemic (Agostino, Arnaboldi, & Lema, 2021; Xie, Zang, & Ponzoa, 2020).

However, DGT does not provide a "silver bullet" for resolving the crisis; instead, it creates a new set of challenges. On the one hand, these challenges are due to the characteristics of DGT. Even before the pandemic, it had been pointed out that the concept of DGT is not clear and does not reflect the public sector's characteristics, which are different from those of the private sector (Meijer, 2018). Furthermore, in contrast to the "rosy" scenarios on DGT, unforeseen consequences of new technologies emerge, resulting in "dismal" scenarios for the future of government. The "wicked" nature of digital transformation has garnered increasing attention from scholars and practitioners in the field of digital governance (Bostrom & Yudkowsky, 2014; Fountain, 2019). These concerns and challenges are related to and lead to discussions on artificial intelligence (AI) trustworthiness, criticisms of surveillance capitalism, and digital authoritarianism.

On the other hand, the dilemmas and paradoxes of DGT are exacerbated due to specific characteristics of controlling the pandemic.

¹ CNBC News. (AUG 30, 2021). "Hate crimes against Asian and Black people rise sharply in the US, FBI says."

<https://doi.org/10.1016/j.giq.2022.101690>

Governments have implemented digital measures to control not only the virus but also the potential hosts of the virus – the population (Yoon, 2021). In using digital measures during the pandemic, such as contact tracing apps (CTAs) and analysis of personal data, the conflict between public safety and citizens' privacy widened. With the pandemic, for instance, the debates on how far digital technology can infiltrate everyday life for the sake of public safety and how citizens can negotiate the rapid digital transformation of the state have intensified (Gerli, Arakpogun, Elshahn, Olan, & Prime, 2021; Rowe, 2020; Yoon, 2021).

The guest editors of this special issue believe that we have arrived at the “inflection point” of DGT (Littman et al., 2021). With the rapid development of digital technologies, DGT has been legitimated in response to the pandemic, contributing to innovative efficacy. However, such an achievement has led to a slew of dilemmas, paradoxes, and ambiguities surrounding DGT. Practically, governments have started to discuss introducing a series of regulatory measures on the use of digital technologies and the big-tech companies, as evidenced by the discussion of the AI Act in the European Union (EU) (European Commission, 2021) and the regulation of big-tech companies' monopolistic market behaviors. There are also algorithm watchdog institutions already established and operating. The guest editors believe it is time for scholars and practitioners in this field to seriously consider the downsides and risks associated with the widespread adoption of digital technologies and discuss the concerns and challenges of threats to public values that democracy has pursued in pushing forward DGT.

In this vein, this special issue's primary motive is to comprehensively discuss the promises and challenges DGT presents. It focuses on the nature of the problems and the dilemmatic situation in which to use the technologies. Furthermore, it covers government capacity and policy implications for managerial and institutional reforms to respond to the threats and the uncertainty caused by disruptive digitalization in many countries. This editorial note provides an overview of previous literature on DGT as a controlling measure of the pandemic. When we focus more on DGT as a measure of controlling the COVID-19, we can better understand the natures of the challenges of DGT and what types of capabilities and policies should be formulated to address its dilemmas and paradoxes.

The authors adopted a systematic literature review approach to select the literature for this editorial note (Zuiderwijk, Chen, & Salem, 2021). First, we conducted a comprehensive literature review on the relationship between digital technology and government in general. We also made an extensive search of the literature using the Web of Science and Scopus databases on DGT, combining the keywords related to “digital transformation” (e.g., digital transformation, digital measure, information, data, IoT, social media, platforms, artificial intelligence) together with keywords related to “COVID-19” (e.g., pandemic, corona, and lockdown). After searching the literature on the databases, we checked the relevance of screening the literature about “government” and “the public sector.” Finally, we found 41 articles published in academic journals and conference proceedings. The articles explicitly refer to DGT published from 2020 to 2022, highlighting the novelty of this research stream.

Furthermore, we also reviewed the literature related to DGT, which had been published before the pandemic, focusing on DGT's definitions, practices, and challenges. Specifically, to clarify the theme of this special issue and justify our claims, not only the literature on innovative information and communication technology (ICT) use in the public sector, published in academic journals including *Government Information Quarterly*, but also the papers in conference proceedings such as dg.o and ICEGOV. To avoid the possible missing of important papers, the authors also referred to the literature review articles which cover this special issue theme (de Sousa, de Melo, Bermejo, Farias, & Gomes, 2019; Kankanhalli, Charalabidis, & Mellouli, 2019; Liu & Kim, 2018; Zuiderwijk et al., 2021).

The remainder of this editorial note is organized as follows. In [Section 2](#), we discuss the definition and the innovative results and

performance of DGT, emphasizing combating the pandemic. In [Section 3](#), we critically evaluate the literature on the dilemmas and paradoxes of DGT. In [Section 4](#) we discuss our current trajectory and the theoretical and policy implications of DGT in an era of crisis. Finally, we briefly overview the five papers published in this special issue.

2. Promise and practice

2.1. Definitions and expected benefits of DGT

Digital government has evolved to find innovative digital ways to respond to social, economic, political, and other pressures (Janowski, 2015). The new “paradigm-shift” technologies have already enabled governments to provide citizens with more tailored public services, forecast with greater accuracy, and simulate complex systems ranging from military operations to the private sector of entire countries (Margetts & Dorobantu, 2019). While practitioners in the public sector implement digital transformation initiatives beyond the mere digitization or digitalization of existing offline processes, the academics in this field also seek to define the concept of digital transformation and understand when, how, and why these initiatives succeed or fail.

The term “digital transformation” refers to the broader, more profound transformations ICT enables in industry, governance structures, and ecosystems (Fountain, 2019). Vial (2019: 121) defines the digital transformation as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies” based on the analysis of 23 unique definitions. These definitions of digital transformation share two key ingredients: digital technologies and significant changes.

However, studies of DGT pay attention to different aspects of digital transformation. For example, Mergel, Edelmann, and Haug (2019) stress improving relationships between public administrations and stakeholders, increasing citizen satisfaction with government services, and changing bureaucratic and organizational culture based on digital transformation. Vogl et al. (2020: 947) highlight DGT from the standpoint of bureaucratic changes arguing the emergence of “algorithmic bureaucracy” as “combining people, computational algorithms, and machine-readable electronic files and forms to deal with complexity and overcome some of the limitations of traditional bureaucracy, whilst preserving core public sector values.”

Other studies regard “government as a platform” as a form of DGT (Brown, Fishenden, Thompson, & Venters, 2017; Cordella & Paletti, 2019; Janssen & Estevez, 2013; Kim, Andersen, & Lee, 2021; O'Reilly, 2010; Pope, 2019; Styryn, Mossberger, & Zhulin, 2022). Government as a platform can be defined as “reorganizing the work of government around a network of shared application programming interfaces (APIs) and components, open-standards and canonical datasets, so that civil servants, businesses and others can deliver radically better services to the public, more safely, efficiently and accountably (Pope, 2019: 5).”

Despite these scholarly efforts to define DGT in academia, there remains a terminological gap and a scarcity of research in the actual body of literature on DGT (Tangi, Janssen, Benedetti, & Noci, 2021). To fill this gap, Tangi et al. (2021) integrate (1) the concept of radical change, (2) the elements that compose an organization, and (3) the role of digital technologies and their effect on the organization. Based on the comprehensive literature review, they define DGT as “second-order organizational changes enabled by digital technologies transforming the way organizations are structured and organized and resulting in a new state, from the point of view of processes, culture, roles, relationships, and possibly all aspects of the organization (Tangi et al., 2021: 2).”

These definitions of digital transformation include the components of and the necessary conditions for referring to digital transformation. Based on a comprehensive literature review on the digital transformation in the private sector, for example, Vial (2019) presented a framework whose building blocks are: (1) use of digital technology, (2)

disruptions, (3) strategic responses, (4) changes in value creation, (5) structural changes, (6) organizational barriers, (7) negative impacts, and (8) positive impacts based on a comprehensive literature review on digital transformation.

It is not easy to find the components of DGT due to the complexity of public organizations and their relationships. However, [Tangi et al. \(2021\)](#) point out the organizational areas deeply impacted by DGT, such as organizational processes, people, culture, and structures. Furthermore, DGT leads to a complete redesign of the information systems (technological components) and requires a rethinking of managerial activities, employees' skills, responsibilities, competencies, and the endorsement of different working values, both collectively and individually ([Tangi et al., 2021](#); [Vial, 2019](#)).

What are the expected benefits of DGT? In recent research, the augmented government has been presented as the primary benefit of DGT. Through the adoption of digital technology, government can overcome bureaupathology and strengthen the capabilities of public organizations and officials with reducing administrative costs. ([Eggers et al., 2017](#)). DGT also enables predictive administration. Before implementing policies, governments can better detect real-world complexity, find patterns in data, and use them to improve prediction accuracy, lowering costs for trends and future events by adopting actor-based computing models combined with large-scale data. ([Agrawal, Gans, & Goldfarb, 2018](#)). To identify unintended consequences before their occurrence, governments can also leverage digital technology to experiment and simulate the results of policy alternatives.

2.2. DGT as an effective tool to fight against COVID-19

In turbulent times, governments worldwide must embrace digital transformation as a necessity, not as an option, to respond to the pandemic and meet citizens' changing expectations of the government's ability to deliver high-value, real-time digital services during the pandemic ([Gabryelczyk, 2020](#); [Hassounah, Raheel, & Alhefzi, 2020](#); [Kummitha, 2020](#); [Moon, 2020](#)). The South Korean government, for example, introduces major ICT-enabled innovations for managing this infectious disease-driven crisis in four stages: screening and diagnosis (smart quarantine information system, international traveler information system, and self-health check app for entrants under special entry procedures), epidemiological investigation (epidemiological investigation system and global epidemic prevention platform for digital tracing), patient and contact management (self-quarantine safety protection app, patient management information system, and AI-based automatic counseling), and prevention (micro page, Corona Map, and chatbot) ([Nam, 2020](#)).

Some scholars pay attention to DGT's impact on local-level governance. [Aristovnik et al. \(2021\)](#) present a comparative study on how the first wave of the pandemic impacted general administrative authorities on the local level concerning various aspects of their functioning and digitalization in five European countries. [Hossain \(2021\)](#) argues that ICT intervention and innovation for digital transformation in local governance increased accountability and transparency through easy and effective mass participation of people to strengthen local democracy to respond effectively against COVID-19 in Bangladesh.

Some studies investigate the digital technology-based innovation against the pandemic in different fields, such as education ([Agasisti, Frattini, & Soncin, 2020](#); [Bogdandy, Tamas, & Toth, 2020](#)), health care ([Do Nascimento et al., 2020](#)), urban planning ([Buonocore, Martino, & Ferro, 2021](#); [Zgórska, Kamrowska-Zaluska, & Lorens, 2021](#)), and culture and tourism ([Nosrati & Detlor, 2021](#); [Wilford et al., 2021](#)). For example, [Locatelli and Lovari \(2021\)](#) present the concept of the platformization of healthcare communication based on their investigating the impact of social media incorporation on the local health authorities' Facebook communication during the pandemic in Italy.

Other researchers paid attention to the impact of specific technology, including social media, virtual reality (VR) and augmented reality (AR),

and AI. For instance, social media platforms are crucial for disseminating vital public health and pandemic response information ([Padeiro, Bueno-Larraz, & Freitas, 2021](#)), for soliciting cross-boundary collaboration in the fight against COVID-19 ([Lee, Lee, & Liu, 2021](#); [Locatelli & Lovari, 2021](#); [Zeemering, 2021](#)), and for public service delivery when an onsite service cannot be provided in the pandemic situation ([Agostino et al., 2020](#)).

Additionally, VR and AR technologies are believed to be highly effective and beneficial in delivering a shared set of values, information, and ideas to the public that governments wish to deliver. For example, [Nowak et al. \(2020\)](#) empirically analyze the impact of VR-mediated communication on increasing influenza vaccination. They conclude that through creative executions that increase a sense of presence, immersive VR has the potential to significantly increase the understanding of crucial immunization concepts, such as community immunity.

The impact of the AI-based public healthcare systems is also examined, emphasizing how the systems enhance governments' capacity to respond to the pandemic. More specifically, AI applications have helped physicians by automating a range of diagnoses, prioritizing healthcare resources, and enhancing vaccine and drug development ([Shahid et al., 2021](#)). Additionally, in the Middle East, AI-based healthcare systems can enhance problem-solving performance and decision-making in the presence of government to government (G2G) knowledge exchange ([Nasseef, Baabdullah, Alalwan, Lal, & Dwivedi, 2021](#)).

Furthermore, some research proposes a framework using disruptive technologies to control and analyze COVID-19 effectively. The framework is built to integrate different disruptive technologies of AI, industry 4.0, Internet of Things (IoT), Internet of Medical Things (IoMT), big data, VR, drone technology and autonomous robots, 5G, and blockchain, which is to provide governance with an integrated vision to use and manage the technologies to fight against the pandemic ([Abdel-Basset, Chang, & Nabeeh, 2021](#); [Mendonça & Dantas, 2020](#)).

Some researchers emphasize the value of data and information in and of itself, arguing that COVID-19 is not only a public health crisis but also an information crisis. It is argued that information disclosure through various forms of digital technologies effectively assists citizens in preparing for the pandemic and reduces their anxiety by delivering quality information on the pandemic. More precisely, improved information quality results in an enhanced ability to respond promptly to the crisis and a lower level of information overload during a pandemic ([Alamsyah & Zhu, 2021](#)). Additionally, it strengthens citizens' information security behaviors ([Tang, Miller, Zhou, & Warkentin, 2021](#)).

These data transparency and information disclosure initiatives lead to a new public-private partnership and another type of "unintended" crowdsourcing by government officials in response to the pandemic ([Kim, Cha, Cho, & Lee, 2020](#)). For example, the Korea Centers for Disease Control and Prevention (KCDC) has made available to the public data on COVID-19 (e.g., travel logs, number of confirmed cases, quarantine facilities for confirmed cases, and number of cases with symptoms) since January 20, 2020, when the first COVID-19 case was confirmed in the country. The COVID-19 data were made available through the KCDC's public data portal and its website in the form of a file and an open API. On January 30, 2020, a college student in South Korea used this COVID-19 data to create a Corona Map website within a single day and shared it for free.² The Corona Map enabled users to view confirmed patients' travel histories, updated in real-time using KCDC data.

While the South Korean government's openness and transparency about COVID-19 initially stirred citizens' fears and outrage, it has largely been received well and trusted by citizens. The comprehensive COVID-19 map provided customized services to meet individual needs

² *The Kyunghyang Shinmun*. (2020, February 2). "The lack of information, the anxiety of fake news"...A college student who made the 'Corona map.'

(e.g., checking patients' travel logs, obtaining information about facilities where confirmed cases were located, and searching for testing and treatment hospitals).³ Several developers and companies have utilized AI and machine learning to create databases on the travel histories of confirmed patients, which are available as open-source data, or to develop visualization services. These examples of quality information disclosure and good governance in the face of pandemics demonstrate that while transparency initially created some disruption, fear, and distrust, it eventually helped restore public trust and allay unnecessary fear in the long run (Mansoor, 2021; Moon, 2020).

3. Challenges, dilemmas, and paradoxes

3.1. Diverse challenges that DGT encounters

Academic research and government practices on DGT encounter a number of challenges. The authors believe that at least three sources contribute to these challenges. First, the conceptual definition of DGT is ambiguous. It has been argued that the concept of DGT should be defined more precisely by taking into account the unique and specific characteristics of the public sector practices (Meijer, 2018; Mergel et al., 2019). However, there is a dearth of systematic research on how public administrators define and understand digital transformation.

There remains a scarcity of comprehensive research on the success/failure factors of DGT. Tangi et al. (2021) point out that the low level of the literature's methodological rigor is due to its reliance on qualitative research methods, which focus on the impact of a few factors on DGT. In this vein, Omar, Weerakkody, and Daowd (2020) argue that DGT research should produce a contextual-independent conclusion that is reproducible. Kummitha (2020) argues that the lack of research on contextual factors limits our understanding of the right directions for DGT with a cross-national comparative case study on the approach to contain the spread of COVID-19 between Chinese and Western governments.

Furthermore, several impediments complicate DGT, and different research pays attention to different factors' impact. For example, some scholars stress the importance of institutional arrangements in designing, adopting, and using digital technologies (Fountain, 2004; Harrison & Johnson, 2019; Luna-Reyes & Gil-Garcia, 2014; Mergel et al., 2019). Others emphasize the roles of managers who play a leading role in this transformation process, hindering or fostering the change, depending on how carefully they plan and implement change management activities and organizational and cultural factors (Ashaye & Irani, 2019; Nogršek & Vintar, 2014; Weerakkody, El-Haddadeh, Sivarajah, Omar, & Molnar, 2019).

Second, we face the dilemma between accelerating DGT to maximize its benefits and simultaneously slowing it down to address possible concerns and side effects. Despite optimistic views toward digital transformation in the public sector, concerns about the unexpected and undesirable consequences of ICT usage have been presented. The impact of social media is one example of controversy. Several scholars argue that social media effectively promotes democracy and civic participation because it expands opportunities for people to engage in governance more interactively (Driss, Mellouli, & Trabelsi, 2019). However, others argue that governments' use of social media might reinforce existing power differentials and create new challenges for inclusion, accountability, and democracy (Feeney & Porumbescu, 2020).

Furthermore, the recent accumulation of AI and digital technology use has brought up new cost and challenges, in part because the advancement of AI applications has been facilitated by the availability of enormous amounts and types of public and private data (de Sousa et al., 2019; Hagerty & Rubinov, 2019). These cost and challenges also led to

social debate around the extent to which AI generates not only accurate and timely information but also unbiased outputs. Some scholars warn that recent AI-enabled applications may generate biased decisions as a result of the extensive and persistent use of biased data at the societal level (Fountain, this issue; Joyce, Louderback, & Robinson, 2021; Janssen, Brous, Estevez, Barbosa, & Janowski, 2020; Toll, Lindgren, Melin, & Madsen, 2019; Valle-Cruz, Alejandro Ruvalcaba-Gomez, Sandoval-Almazan, & Ignacio Criado, 2019; Zuiderwijk et al., 2021).

Other scholars, however, seem to adopt an ambivalent viewpoint to this problem. To address these contradictory results of AI adoption, they take a scenario-based approach and expect possible consequences, including both "pros and cons" of adopting the technologies. For example, König and Wenzelburger (2020) discuss AI adoption's potential benefits and drawbacks for democracy. Additionally, some studies analyze the advantages and disadvantages of AI adoption in terms of public values such as accountability, equity, legitimacy, and political feasibility (Busuioc, 2021; Young, Bullock, & Lecy, 2019; Young, Himmelreich, Bullock, & Kim, 2019). To resolve these conundrums surrounding DGT, we need additional empirical evidence on how new technologies impact the public sector. Furthermore, future research should place a greater emphasis on determining why and when digital transformation research and practices generate conflicting evidence regarding the impact of new technologies in the public sector (Desouza, Dawson, & Chenok, 2020).

Third, we face the paradox that DGT can result in "unintended" social problems, which may cause further upheaval. It has been argued that digital transformation has the nature of a 'wicked problem' due to its high levels of uncertainty, complexity, interdependence, and adaptation associated with digital technology use (de Bruijn, Warnier, & Janssen, 2021; Fountain, 2019; Kim & Zhang, 2016). Certain cases demonstrate that digital transformation exacerbates existing social and economic inequalities unless policymakers proactively address such inequalities. It is also predicted that robots and AI will eliminate some jobs or replace human labor in the near future (Fountain, 2019).

Concerns about the wickedness of digital transformation, some pessimistic scenarios of DGT are presented. For example, the World Economic Forum (2014) painted a scenario in which the world is transforming into a 'digital panopticon,' with governments monitoring their citizens' behaviors. This dystopian view has evolved into the concept of digital authoritarianism or tech-enabled authoritarianism. This concept relates to authoritarian governments' use of technology to control and shape the behavior of their citizens through surveillance, repression, manipulation, censorship, and the provision of services to retain and expand political control. Additionally, digital authoritarian states conduct disinformation campaigns to manipulate citizens while penalizing and censoring dissenting speech on the internet and elsewhere under "fake news" laws (Khalil, 2020). According to Dragu and Lupu's (2021) game-theoretical analysis, digital technology developments may not be detrimental to authoritarian control but may strengthen authoritarian control by facilitating a wide range of human rights abuses.

On the other hand, the concept of surveillance capitalism has emerged as another form of wicked digital transformation. Surveillance capitalism is defined as "the unilateral claiming of private human experience as free raw material for translation into behavioral data (Zuboff, 2019: 8)." In this economic system of the surveillance capitalism, profits are made from capturing, rendering, and analyzing behavioral data. Regarding the relationship between surveillance capitalism and democracy, she presented that "surveillance capitalism's 'means of behavioral modification' at scale erodes democracy from within because, without autonomy in action and in thought, we have little capacity for the moral judgment and critical thinking necessary for a democratic society. Democracy is also eroded from without, as

³ *Electronic Times*. (2020, March 24). From public to private... Datasets shined by the Corona 19 crisis.

surveillance capitalism represents an unprecedented concentration of knowledge and the power that accrues to such knowledge.”⁴

In this vein, the European Commission proposed a “private algorithm” as one of the possible scenarios for the future government. In such a scenario, the state loses political power while ‘big-tech’ exerts significant influence over the government. Through the platforms of multinational digital companies, decision-making is fully automated, utilizing a combination of big data, algorithms, and robots to process the information. Democratic participation is practically an illusion. Citizens are viewed purely as consumers and not as active participants in policy-making (Vesnic-Alujevic, Stoermer, Rudkin, Scapolo, & Kimbell, 2019).

In practice, these concerns have contributed to the failure of several ambitious digital transformation projects. A notable example is the failure of the smart city in Toronto, Canada. The smart city master plan, announced by Google’s sister company Sidewalk Labs, was massive, clocking in at 1500 pages. Nearly 60 high-tech companies were expected to participate in implementing the smart city project in Toronto. Countless sensors connected to the internet across the region would collect and analyze huge volumes of data on temperature, air pollution, noise, and waste emissions with AI to predict and analyze heavy rains and reserve rainwater from building rooftops for immediate use in landscaping (Sidewalk Labs, 2019).

However, such ambitious plans were shelved. Economic uncertainty caused by the spread of the COVID-19 pandemic was cited as an official reason for the cancellation of the project. However, numerous concerns about public values, such as privacy, a lack of trust, accountability, transparency in decision-making, and the political legitimacy of private IT companies involved in public policy, were raised repeatedly, eventually leading to the project’s failure. This example demonstrates that AI-based digital transformation cannot be accomplished solely through advanced technologies. It suggests that the economic environment, the political legitimacy of urban policy, institutional contexts, and worries about privacy protection all play a role in the success of digital transformation in government.⁵

3.2. DGT as another challenge in the pandemic era

The academic challenges and conflicts between different perspectives are found in previous literature regarding the theme of DGT as a response to COVID-19. The first challenge is related to the success/failure factors of DGT. Some studies raise doubt about DGT’s effectiveness for various viewpoints based on the complexity of ICT adoption and technology enactment. For example, Mora, Kummitha, and Esposito (2021) criticize the favorable research and narrative on the roles of digital technologies in containing COVID-19 tend to oversimplify the complexity of technology adoption. They argue that the potential affordance and effects of technologies adopted for containing the pandemic are mediated by the socio-material arrangements that users assemble to connect their goals to the materiality of technological artifacts and the socio-organizational context in which technology deployment takes place.

Some research points out the importance of contextual factors, including the political background and institutional framework, which mediate the technology implemented and human interaction. According to the following study, these contextual factors are critical in producing the expected benefits of DGT. Based on an analysis of academic papers, official reports, and newspapers, Kummitha (2020) compares two opposing approaches to control the transmission of COVID-19: a technodriver approach in Chinese cities and government and a human-driven approach in Western governments. The difference between the

technological response from China and Western democracies shows how the political and institutional regime can force the ways of using smart technologies to address a pandemic and the performance of DGT. Joia and Michelotto (2020) pay attention to other social and political factors, the social representation of the COVID-19 pandemic. Social representations can be defined as a system of values, ideas, metaphors, beliefs, and practices that establish social order, orient participants, and enable communication among groups and communities (Sammut & Howarth, 2014). This research concludes that DGT of Brazil may be pushed forward passively or play auxiliary roles in the pandemic because Brazilian society privileged prophylaxis and health, via social isolation rather than DGT and other digital transformation projects to fight COVID-19, which are positioned in the peripheral system of the social representation of the pandemic in the Brazilian context.

In addition to the contextual factors, behavioral factors that stress the roles and attitudes of actors and stakeholders are presented as a success/failure factor of DGT against the pandemic. For example, Barutia and Echebarria (2021) find that the pandemic has led public managers to be more confident in the capacity of ICT to help cities achieve their economic, social, and environmental goals and respond to challenges. Lee, Lee, and Liu (2021) illustrate how collaborative public-private partnerships played a critical role in developing and deploying innovative practices in Singapore to manage the COVID-19 crisis.

Of course, organizational factors have been stressed as a success factor of DGT during the pandemic. Aristovnik et al. (2021) investigate the use of ICT by local general administrative authorities during pandemics, comparing five European countries (Czech Republic, Germany, Poland, Romania, and Slovenia). Their results of empirical analysis based on a survey of 926 respondents illustrates that pandemic-imposed changes are very similar in these countries, and the organizational factors play the critical role in responding to the pandemic as follows. First, the regulations and competencies of administrative authorities hold important implications for the accelerated digitalization of authorities after the pandemic. Second, the use of simplified digitalized procedures by parties is an essential driver of accelerated digitalization. Third, a rise in difficult work coordination in the absence of staff and the opportunity to digitalize work processes increases the likelihood of being on a higher level of accelerated digitalization after the pandemic. Finally, concerning cost management, the utilization of ICT equipment was found to be a driver of accelerated digitalization after the pandemic.

These literature review results show different kinds of factors that impact the success/failure of DGT to contain the pandemic. This implies that the lack of research on factors from a comprehensive perspective, which includes all the success factors of DGT, is likely to limit our understanding of the right directions for DGT. In addition, the conceptual ambiguity of DGT appears to stem from the fact that different countries approach digital transformation differently, as using digital technologies varies according to the country’s size, history, and present context (Kummitha, 2020; Omar et al., 2020).

The authors of this editorial note also find the dilemmas and paradoxes of DGT in controlling the pandemic. One of the primary sources of the dilemma is the privacy problem, which has occurred worldwide. For example, Yoon (2021) argues that the South Korean government’s digital measures during the pandemic involved the extensive use of personal data without citizens’ sufficient participation in the flow of information. This article also criticizes that the government coped with the pandemic through digital surveillance to avoid physical lockdown, and in so doing, projected its desire for a transition to a digitally advanced state while facilitating nationalism through a digital utopian discourse.

The controversy on CTA adoption is an example of DGT’s challenges in the pandemic. Gerli et al. (2021), for example, highlight that the adoption of CTAs and other e-health applications to control the pandemic can have shortcomings in their design and hamper the public value of technology applications. Furthermore, the e-health applications

⁴ *The Harvard Gazette* (March 4, 2019). “High tech is watching you.”

⁵ *BBC News*. (May 7, 2020). “Coronavirus: Google ends plans for smart city in Toronto”. *The Guardian* (October 23, 2018). “‘City of Surveillance’: Privacy expert quits Toronto’s smart-city project.”

are affected by exogenous factors, including “structural inequalities in the usage of ICT (such as the digital divide), path dependencies in the digital economy (due to the market power of digital platforms) and trade-offs between individual rights and public interest in the use of personal data (Gerlie et al., 2021: 8).” Rowe, Ngwenyama, and Richet (2020) also criticizes DGT policy, focusing on the privacy-related issues of using CTAs in France. This study argues that the app’s adoption generates significant risks to citizens’ informational privacy, surveillance, and habituation to security policies. It also may create discrimination and distrust and generate other health problems such as addiction. Therefore, it reinforced alienation and undermined effectiveness in managing the crisis (Rowe et al., 2020). The research on CTA adoption problems commonly emphasizes inclusiveness, transparency, and civic participation in the design and implementation of the applications.

Another dilemma and paradox of DGT is the public skepticism and distrust in government. For example, Polzer and Goncharenko (2021) reveal a high level of public skepticism and a general distrust of the UK government regarding implementing CTA. This skepticism and distrust led to widespread public distress over the potential violation of democratic freedoms and misuse of the data collected by the app. Finally, this study reflects on the linkages between the lack of governmental accountability and the difficulties in mitigating the expressed societal concerns, causing a corresponding resistance on the part of the public to engage in and support co-production.

From the macro perspective on DGT against the pandemic, Gavrilenko and Markeeva (2020) propose the concept of “digital colonization.” Digital platforms are transforming people’s daily lives and colonizing social space. The strengthening of digital platforms in countries’ economies in the pandemic leads to monopolizing markets and limits the possibilities of traditional organizations. Platform ideology becomes dominant for managerial systems at the macro and micro levels. This study anticipates that the platformization of the economy will inevitably lead to acute political crises due to the destruction of the institutionalized reciprocity between (1) business and population and (2) business and government.

4. Future direction

4.1. Research direction

From an academic viewpoint, discussion around DGT should be realistic and relevant in the sense that it should lie not in ‘rosy’ consultancy reports or populist political slogans. Instead, it should lie in rigorous scientific research on the co-evolution of technology and government, which results in a world free of abuses, suffering, and destruction. The digital government research community should play a critical role in this regard by learning how to share important trends and findings with the public in an informative and actionable manner that is free from hype and is transparent about the dangers and unintended consequences and opportunities and benefits (Littman et al., 2021). The digital government research community should conduct a more comprehensive study on how connectivity enabled by social media platforms will improve the quality of life worldwide and develop trustworthy knowledge about how governments can foster innovative opportunities supported by new technologies, thereby contributing to creating public values through an intelligent society.

Future research should place a greater emphasis on DGT’s conceptualization and operationalization. We should approach it comprehensively by considering diverse components of DGT, such as data, platforms, infrastructure, public services, and governance. It may also be helpful to identify the typology of digital transformation by segmenting it according to the type of public sector service and its subsectors, such as health, traffic, safety, or social services. As we have seen in the section of challenges of DGT of this editorial, diverse factors, including contextual, behavioral, institutional, and managerial factors, impact not

only the success/failure of DGT. The factors also influence the concept and its ways of pushing forward of DGT. More comprehensive and balanced perspectives on the influential factors on DGT will be needed in academia.

Methodologically, machine (deep) learning, big data analysis, and social network analysis are not new anymore. These methods have become pervasive and widely used in this field. Even in the field of social science, computational social science (CSS) has exploded in prominence over the past decade (Lazer et al., 2020). Because of the digital transformation of controlling the pandemic, now researchers have access to an unprecedented amount of social data which trace people’s movement, experimental designs, and large-scale simulations. This growth of CSS and the methodological advance is helpful to enhance the research validity and produce effective policy suggestions to fight against the pandemic (Nature, 2021).

CSS is a powerful research tool, but triangulation between qualitative and quantitative research methods should be more energetically pursued because triangulation can be helpful to extract real meaning from data, clearly define research objectives, and validate and interpret the results more appropriately. To achieve these advancements in our research, we should strengthen the multidisciplinary collaboration among different digital government research groups. Furthermore, it will be desirable to adopt enforceable guidelines in collaborations with industry and government around the “cutting-edge” analytical methods for replicability of research (Dwivedi et al., 2020; Nature, 2021).

At the same time, researchers should remember the ethical issues related to gathering and analyzing personal data. The digital government research community should understand that it poses many challenges to society and people’s privacy, and these issues could lead to the risks of surveillance and digital authoritarianism aforementioned in this editorial. Multilateral collaboration across the academic disciplines and the private and public sectors is also required to respond to the issues of research ethics, transparency, and privacy (Dwivedi et al., 2020; Nature, 2021).

4.2. Practice and policy recommendations

Practically, the concerns and challenges related to DGT led to the passage of regulatory measures in the US and EU—most notably, the EU’s 2018 General Data Protection Regulation (GDPR). Governments have started to discuss introducing a series of regulatory measures on the use of digital technologies and big-tech companies. In the EU, for example, there is already a draft AI regulation (European Commission, 2021). This introduction of regulatory measures and guidelines requires government leaders and managers to focus on enhancing the government’s capacity to capitalize on opportunities presented by new technologies. Specifically, governments should build the capacity to gather more data and information efficiently, integrate them effectively, and streamline processes that allow data and information to flow seamlessly within and across government organizations, as well as across government agencies and sectors, in order to achieve successful digital transformation (Meijer, 2018).

We recommend that government leaders and managers focus on collaborative governance, recognizing that involving diverse stakeholders will help them handle high levels of uncertainty, ambiguity, and dynamic developments associated with responding to digital transformation challenges (DeFries & Nagendra, 2017). Communication with diverse stakeholders across a variety of media platforms is also necessary to alleviate concerns and respond to the challenges associated with digital transformation (Leurent, Betti, Shook, Fuchs, & Damrath, 2019). Furthermore, we advise that government leaders and managers pay closer attention to the role of big data analysis in designing and implementing user-friendly public services, as well as the implications for public-private partnerships on new governance in an intelligent society. These measures necessitate institutional and managerial reforms across government agencies and sectors, which frequently entail unpleasant

shifts in power, authority, resources, and traditions (Fountain, 2019).

5. This special issue

Based on the analysis conducted in previous sections and the motive of this special issue, the guest editors selected five papers covering various topics relating to DGT in these turbulent times. Specifically, the selected papers address the following research questions: (1) What challenges have been identified as major impediments to advancing DGT? (2) How should governments and public officials facilitate DGT to foster the creation of public values? (3) What are the governance features and the government's capacity to respond to the challenges resulting from DGT in these turbulent times? The guest editors expect this special issue to contribute to better understanding on the nature of the problems and the dilemmatic situation in which to use the technologies. These papers also contribute to improving government capacity and policy development for managerial and institutional reforms to respond to the threats and the uncertainty caused by disruptive digitalization in many countries. All the papers were selected from the papers acknowledged as high-quality by the chairs at the dg.o 2020 conference. They underwent a rigorous double-blind review process and were evaluated by expert reviewers. We briefly summarize the core ideas of each accepted paper below, in the order in which they appear in this special issue.

To address a question of major impediments to advancing DGT, the paper by Fountain focuses on systemic or institutionalized racism in the era of digital transformation. She argues that systemic racism is institutionalized bias regarding race, ethnicity, and related attributes. Such bias is located in data that encode the results and outputs of decisions that have been discriminatory, in procedures and processes that may intentionally or unintentionally disadvantage people based on race, and in policies that may discriminate by race. Computational algorithms are likely to exacerbate systemic racism unless they are designed, developed, and implemented with a focus on identifying and remedying racial bias. Enhancing social equity in digital governance requires the government to make sustained and systematic efforts to ensure that automated decision-making systems and their implementation in complex public organizational arrangements are free from systemic bias.

The paper by Ahn and Chen focus on examining how the perception of government employees shapes their willingness to support the use of AI technologies in government. The analysis of survey data of government officials in the US reveals that the government officials' willingness to implement and use AI technologies was contingent upon a series of positive or negative perceptions about the new technologies, a long-term outlook on the role of AI technologies in society, and their familiarity with and experience with AI applications in the past.

To explore a question of how government should facilitate DGT, Valle-Cruz, Gil-Garcia, and Fernandez-Cortez attempt to address how AI-enabled decision-making for budget allocation affects its outputs and outcomes such as GDP, inflation, and equity. In order to address this question, the authors propose an algorithmic approach for processing budget inputs (specific expenditures) to generate economic and political outputs such as GDP and inflation, as well as social outcomes such as the Gini index, a measure of economic inequity, and analyze country-level longitudinal data of 217 countries between 1960 and 2019. The authors assert that the advantages of deploying an AI-enabled decision-making support system in government budget allocation stem from the system's ability to process enormous volumes of data and uncover patterns that are not easy to detect, such as multiple non-linear relationships.

Van Donge, Bharosa, and Janssen's study discuss how government agencies can employ data stewardship strategies in ecosystems. The primary objective of this exploratory work is to identify and compare data stewardship strategies employed in government-business ecosystems. Following an exploratory case study approach, this paper identifies and analyzes three different configurations of inter-organizational

data stewardship: 1) the government-led ecosystem, 2) the government-business-led ecosystem, and 3) the regulation-led ecosystem.

Lastly, Villore and Criado's research attempts to address a question of governance features and the government's capacity to respond to the challenges resulting from DGT by examining the factors serving as barriers to the social media institutionalization process in municipalities in Spain. The authors discuss and propose a social media institutionalization index. They used a mixed-method approach to collect and analyze survey data from public managers in municipal governments and interview data from government employees in charge of communication and social media in one large city council in Spain. The authors found that social media institutionalization has not yet reached its full potential in their sample of large municipalities in Spain. In addition, they found that public managers and city council employees perceive the absence of a governance framework as the most significant impediment, followed by security, lack of resources for maintenance, control, and evaluation, and organizational culture.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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