

Информационное общество и власть**THE DATA-DRIVEN PUBLIC SECTOR AS A CHANNEL FOR BUILDING
RESILIENT DIGITAL SOCIETIES**

Статья рекомендована к публикации членом редакционного совета Ю.Е. Хохловым 09.09.2020 г.

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Abstract

Experts have termed the current age we find ourselves in as industry 4.0 where data is one of the most essential ingredients across all sectors – public and private. With many public sector electronic services transitioned and still migrating to digital platforms (e-government) there are numerous opportunities for governments to leverage on modern technology and big data to improve upon service delivery.

Research has not considered the role of the big data analytics in building digital societies that thrive in times of hardship. Resilience is essential in modelling the data-driven public sector of the future. As such, this article explores the role data science plays in supporting decision making by government as well as building a resilient society that is capable of achieving sustainable development.

With the global health crisis that brought economies to a standstill almost the whole of the year 2020, at the time of publication, the COVID-19 (SARS-CoV-2) pandemic was highlighted as a clear example of what the data-driven public sector actually can contribute and the role of data in government decision and policy making.

Keywords

Data-Driven Public Sector, E-Government, Digital Economy, Big Data, Resilience, SARS-CoV-2

1 Digital Government and Resilient Information Societies

Data and information production driven by the increased technological infrastructure thus we are evolving as an information society. The dependence on data and information as a result of digitization is inescapable. Be it, governments, public servants, the private sector, or individuals, there is a constant exchange of data – both private and public. Hence, data being tagged as the new currency – much of which is and will continue to consist of private/personal data [1]. As such governments are beginning to take the mandate upon themselves to be responsible custodians and stewards of data being handed over to them by introducing strategic policies and enforcement regulations [2].

In order to build a resilient knowledge-based economy, Ecuador as an example, sought out to develop its information society aimed at improving and increasing the quality of life of citizens by promoting boosting methods, tools, processes, applications and innovative products that, going beyond the current state of technology, improve significantly the access, benefits and capabilities of services offered to citizens [3]. They strategically tackled this by research, development and innovation in the e-government sphere.

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Today, digital government inclusively is moving from a phase of merely digitizing public sector processes to contextualizing (i.e. policy-driven electronic government). Thus, technology in government is no longer seen as a vehicle for digitizing existing traditional public services for stakeholders to readily use, but influence socio-economic, political, and cultural development in line with the needs and aspirations of countries, regions, cities and other territorial units and their people [4]. We observe the shift towards a more human-centric/citizen-centric approach to designing and implementation of e-services in the public sector. From the inclusion of participatory design, citizen science, to artificial intelligence and automotive concepts in e-government, there is the general desire by a growing number of digital government producers to create value. A national digital strategy that involves multiple actors in and outside government and the creation of appropriate institutions to ensure a long-term vision [5] is a crucial element for the new phase of digital government to support the substantive work of government.

An important discussion that has surfaced within the digital society and e-government research community is that of resilience. Within the digital context, it is defined in literature as the ability of public services to be digitally provided consistently in the case of extreme events; or the ability of communities to thrive in the face of misfortune [6]. Resilience within the digital society sphere has been associated with responsibility; partnership, engagement, connectedness, cohesiveness, and the existence of support structures; adaptability; diversification; championing quality of life and health; resourcefulness [7]. Digital society and digital government research have linked resilience with contexts such as natural disaster recovery, terrorism, cyber threats [8,9]. Thus, strengthening resilience in digital government services is an important aspect of achieving an all-inclusive information society that aims at promoting sustainable development [10].

2 The Data-Driven Public Sector

Since e-government traditionally has been termed as delivery of government services and information to the public using electronic means [11] which aims at higher internal efficiency of government agencies and strives for better transactional services. E-Government 3.0 is built upon the previous e-government versions and is gaining grounds due to an increase in the use of sensors and smart devices which produce big data ranging from human text to sensor data, combined with advanced analytics and modelling, and possibly ubiquitous services (i.e. cloud computing), allowing the smart governance and data-intensive decision making [12]. This is the foundation of the data-driven public sector (DDPS).

The concept of the data-driven public sector (DDPS) is one which recognizes the nature of data as an asset, an integral ingredient to policy making, service delivery, organizational management and innovation [13]. The data-driven public sector has been described as a multi-stakeholder field and groups the factors that drive and influence public sector as strategic and political, organizational, data governance and technical dimensions [14].

The data-driven public sector's adoption is driven by the following drivers – open data initiatives and government as a catalyst – as well as it having the following constraints: a lack of political will, a lack of skilled business-oriented people, Europe's new General Data Protection Regulation (GDPR) uncertainties, the decentralization of public sector offices, and many more yet to be discovered [15].

“With great power comes great responsibility” – a statement of truth whose originator is still an issue of debate. Nevertheless, the new paradigm – The Data-Driven Public Sector – does not come at a cheap price with respect to responsibilities and as such requires a new approach to work on the part of public sector workers. One must also note that the data-driven public sector also comes with the automation of tasks and this means the jobs of public service workers in certain nations may be at stake.

Though they put in effort in carrying out their assigned duties, research showed that ICT skills are less strongly rewarded in the public sector than in the private sector and that estimated returns to ICT skills are significantly higher in the private sector than in the public sector and tend to decrease with age [16]. This paints a gloomy picture of the future of the public sector should this cycle continue. Some recommendations have been made to governments to make up for the talent shortage issue through the introduction of cyber security training programs as well as improving salaries to attract qualified personnel [17]. In the United States, it has been reported that the public sector is facing an aging crisis and outdated processes issue. An article by Carol Brzozowski highlights numerous points which cut across all countries all over the world and recommends that the public sector must learn from the private sector in hiring practices, including internships, career fairs, meet-ups, events, social activities and using more technology [18]. Organizations such as Apolitical.co have created a list of readily available resources targeted at improving the data skills of public servants [19].

In light of the SARS-COV-2 crisis, one can infer that a lot more could be done to prepare a new generation of public sector workers for the data-driven paradigm shift and as such certain necessary requirements are recommended by this article (technical and non-technical requirements): A human-centric work ethic; A general understanding of data and its structure; Open data knowledge; Design thinking skills; Research capabilities; Familiarity with emerging technology; Fundamental software and data analytic skills; Basic cyber security skills; Fundamental level of knowledge in privacy and data protection regulations; Creative cognition, critical thinking and problem-solving skills; Personal development and self-assessment attitude; Communicative and collaborative mentality. The list of necessary skills are substantiated by gathering qualities based on desk research on strategic responses of selected public service workers as well as lessons from public service provision reformation [20–22].

According to Deloitte’s report on the future of work in government, a key attribute to note in is the importance of recognizing value in individuals which plays a vital role in unleashing potential. It is the duty of government to create the enabling environment for public sector employees to provide the necessary services and support needed in the public sector. This is in line with research findings that are indicative of the fact that public service motivation encourages innovation [23]. By creating this environment, public sector workers in this new data-driven public sector will not only go about their duties casually but also with a positive and attitude will be established whereby they would be open to contribute to the business process and the attainment of quality service delivery as well as building the desired resilient society that is able to adapt and thrive in any circumstance.

3 Building Resilient Societies through Data-Driven Approaches (SARS-COV-2 Experiences)

With the increased availability in data, high level of innovation and modern technological infrastructure, building resilient societies is more possible than ever. Data-driven approaches which are human-centric are capable of supporting government decision making during crisis, pandemics, disasters and epidemics. The coronavirus (COVID-19/SARS-CoV-2) revealed various frailties of national institutions, systems and structures all over the world. On the brighter side, data played a key and essential role in combatting the crises as well as decision making [24]. States such as China, South Korea, Taiwan and Hong Kong leveraged on big data in combatting the pandemic to make real-time decisions and fine violators of government regulations [25].

During the peak of the health crisis topics such as fake news, disinformation and misinformation began to surface [26]. Data visualizations also were an essential tool for giving an overview of the diseases’ spread and havoc caused in the health sector and also within the socio-economic spheres. The value of data was highly evident within these peak periods and afterwards. Policymakers and experts depended on data to make decisions such as closing borders, locking down their countries and regions to certain degrees as well as how to handle trade and economic policies. Private sector firms depended on data to make decisions on how to run their firms during the pandemic and bounce back after the crisis. The same can be said for the educational sector which shifted to remote teaching and learning.

Experts and scholars warned the general public and researchers on the importance of being careful with analyzing and presenting data as it could have chaotic ramifications. It has been evident that data was the core ingredient for policy during the COVID-19 pandemic. Smartphones powered by data-driven applications have been integrated into the fight against COVID-19 in areas such as: remote tele-consultation, group counseling, monitoring, tracking, education and training, contact tracing, etc. [27,28].

From a public perspective, one may ask how governments utilized data in decision making during the COVID-19 crisis. Below are a number of selected case studies, success stories and proposed architecture or models of the data-driven public sector in full swing during the COVID-19 pandemic.

- a. Contact tracing – Singapore released a mobile app that via Bluetooth, tracks when two users of the app have been within close proximity [29]. In the case when an individual reports they have been diagnosed with COVID-19, the application allows the Ministry of Health of Singapore to determine anyone logged to be near them. In response, a human contact tracer can then call those contacts to appropriately follow-up. According to the researchers, the government keeps a database linking tokens to phone numbers and identities, it can resolve this list of tokens to the users who may have been exposed. Another case study is connected with that of South Korea, where contact tracing was undertaken using security camera footage, credit card data and vehicular GPS data to trace infected individuals [25].
- b. COVID Tracking – In China, GIS and spatial big data technology were utilized, to provide important scientific and technical support to allow the government to judge the epidemic

situation and formulate prevention and control measure [30]. Also, with 140 million worldwide views, the Johns Hopkins University's Center for Systems Science and Engineering (JHU CSSE) interactive dashboard locates and tallies confirmed infections, fatalities and recoveries with authorized data sources including World Health Organization (WHO), US Centers for Disease Control and Prevention, National Health Commission of the People's Republic of China, European Centre for Disease Prevention and Control, and the Chinese online medical resource DXY.cn [31]. The JHU CSSE's platform data has been one of the most reliable sources for policymaking (governmental, enterprise-wise and for individuals), hackathons, scientific research, a source of facts for media outlets and general public discussions on social media.

- c. Social Distancing Observation – Researchers in the United States noted that New York, San Francisco, New Orleans, and Philadelphia were ranked as the most vulnerable in terms of health risks. As such to enforce social distancing regulations, the researchers proposed data-driven AI applications using smart parking, monitoring large gatherings, and traffic rerouting using drone technology, IOT sensors and analytics [32].
- d. Urban Monitoring – Urban big data was adopted in real-time monitoring of residents' response to lockdown measures in the UK, precisely the North East of England – Newcastle [33]. Their study indicated that the Newcastle Urban Observatory analysis was used in observing social change with respect to abnormal concentrations of traffic outside supermarkets and health-care facilities, pedestrian flow, car par occupancy, bus GPS, environmental indicators of air, climate indicators, energy, water flow and water quality.
- e. Healthcare Logistics – With respect to Taiwan, the single-payer universal healthcare systems (UHS) has alleviated the integration between primary care providers and hospitals, as well as reduced the cost of tracking procedure (Ma et al., 2020). In their letter to the editor, Ma and Tsai proposed that analytics based on proper concatenation of databases may prevent supply shortages for personal protective equipment.
- f. Misinformation, Disinformation and Fake News – In the USA, studies focused emerging health misinformation by tracking social network replies (primarily Twitter) that may have provided accurate information (Kim & Walker, 2020). The researchers used semantic textual similarity that employed verified sources of accurate information (from WHO or CDC) to identify replies that are likely intended as fact checks posted by volunteer or casual fact checkers in response to a parent post. This misinformation assessment focused on posts that were related with antibiotics and a cure.
- g. Welfare and Unemployment – Studies analyzed the impact of the crisis on business and organization. The US Department of Labor analyzed how the unemployment situation in the US worsened due to the COVID-19 pandemic as well as governmental monetary policy interventions, stimulus checks, and financial assistance to individual citizens, organizations and businesses [34,35].
- h. Lockdown Enforcement and Lifting – In China, Baidu big data was used to clusters infected people, identify the spread of the disease during its early stages and these aided in government decisions and actions on lockdown strategies within certain high-risk locations [36]. In the United States, researchers leveraged on big data of human movements and whereabouts in combination with causal econometric methods in order to analyze the interaction between state- and county-level lockdown policies and individuals' physical distancing behavior [37].
- i. Travel Restrictions and Regulations - Policy decisions are made by governments based on available data and tourist surveys are currently used as the main source of data to develop national and regional tourism statistics [38]. As such in the tourism sector governments have been forced to impose travel bans to minimize and manage COVID-19 transmission risks.
- j. Research on Cure(s)/Vaccine(s) – Research pointed out that Artificial Intelligence (AI) and big data are capable of tracking the spread of the virus in real time, monitoring the

effectiveness of health interventions, recognizing specific diagnostic and prognostic features, repurposing existing compounds and discovering new drugs (new molecules), and identifying potential vaccine candidates [39]. The authors indicated that government of China supplemented classical data collection methods with sophisticated computational systems and advanced techniques to aid in the identification of at-risk subjects. In Switzerland, using publicly available data and a holistic bottom-up agent-based simulation approach, researchers aimed at tailoring the spatio-temporal characteristics of COVID-19's spread to match the capacity of local healthcare facilities in order to determine the appropriate logistic needs to prevent the overwhelming of health care services [40].

- k. Economy and Trade – Research studied how the US stock market reacted in the early days of confirmed cases compared to a certain period after the initial confirmed cases [34]. According to their study, the reaction of individual stock markets is closely related to the severity of the local outbreaks, which leads to economic losses, high volatility and unpredictable financial markets. Studies compared government economic policies of past epidemics and the COVID-19 crisis as well as social distancing policies effects on the labor market [32].

With respect to the SARS-CoV-2/COVID-19 crisis and the role of data in decision making, it must be noted that, research also made recommendations to issues of contact tracing and privacy [41], and ethics [42]. According to research, big data-driven surveillance could linger on post COVID-19 and must be repurposed [43]. The unease associated with the threat to privacy in spite of authoritarian states putting in huge efforts to battle SARS-COV-2 using artificial intelligence and machine learning has been expressed by researchers [44]. The researchers put forward recommendations regarding citizen attitude towards handing over personal information for data analytics purposes during such crises.

A challenge associated with the lack of existing resilient measures is the rush to build systems to cushion the suddenly unexpected effects of such a global pandemic. In Moscow (Russia), the Financial Times reports of individuals being fined outrageous amounts while being tracked by rushed government applications due to their non-observance of state regulations during the period of mandatory lockdown [45]. According to the report, the draconian measures put in place by policy makers fined Muscovites by geographically tagging them outside their places of residence, causing public outrage. Despite the good intentions of the government in such a scenario, the reduction or loss of trust cannot be underestimated. Researchers pointed out that states must preserve civil liberties by avoiding invasive measures [46] which have the tendency of costing citizens' financial loss and ultimately dwindling trust in government.

Finally, another challenge associated with a data-driven approach in curbing the pandemic is the exclusion of marginalized groups and societies that are created as a result of the digital divide and socio-digital regimes [47]. As reported by the study, data is resultant from inequality and marginalized groups tend to produce less data. As such policies that are implemented based on available data will gravely sideline these marginalized groups since the data used does not fully fit the framework of the general population.

In the data-driven public sector, the issue of privacy and citizen wellbeing is of great importance. As such the data-driven public sector must be value-driven and human-centric. Public Value theory must be an underpinning concept adopted by policymakers in ensuring the data-driven public sector works at optimal level without infringing on basic human rights. Researchers have argued that the notion of public value is a more fruitful channel to address the complex socio-political impacts of ICT adoption in the public sector [48]. According to their study, "a Public value-perspective is important in the implementation and success of e-government". As such it pertinent that data in the data-driven public sector be utilized as a tool to drive value while maintaining user privacy.

Conclusion

The article was aimed at exploring the data-driven public sector and the role of big data in building resilient digital societies. We also discuss qualities the public service worker of the future must have in order to provide maximum support in the data-driven public sector: creative thinking and research capabilities, open data knowledge, data understanding, human-centric work ethic, familiarity with emerging technology, etc. It also has been revealed that privacy regulations are necessary and must be reviewed frequently due to the fast evolving nature of digital technology. We conclude that in order to build a

resilient information/digital society, public value must go hand-in-hand with the desire to leverage on data-driven approaches to optimize public service delivery and derive maximum utility.

The SARS-CoV-2/COVID-19 pandemic that hit the globe from early 2020 may be perceived as a wake-up call for policymakers to restructure public sector approaches and embrace the role of data in supporting decision making. Lessons learned worldwide from this pandemic will be a platform for preparing public sectors to be able to work and provide quality services to citizens efficiently in the digital age (i.e. resilient societies).

The research contributes to studies on e-government, data-driven interventions in the public sector, the digital economy as well as big data analytics and SARS-CoV-2/COVID-19 research. For future research, it is recommended that researchers focus on the possibilities of involving the gig economy in data-driven public service delivery so as to drive socio-economic development. Also, we recommend future research to develop data-driven models that preserve privacy while not compromising on effective and quality decision and policy support.

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ГОСУДАРСТВЕННЫЙ СЕКТОР, УПРАВЛЯЕМЫЙ ДАННЫМИ, КАК КАНАЛ ДЛЯ СОЗДАНИЯ УСТОЙЧИВОГО ЦИФРОВОГО ОБЩЕСТВА

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Аннотация

На данный момент человечество проживает эпоху, которую эксперты назвали индустрией 4.0 и в которой данные являются одним из наиболее важных компонентов в государственном и частном секторах. Поскольку многие электронные услуги в государственном секторе были переведены и продолжают переводиться на цифровые платформы, у правительств есть множество возможностей использовать современные технологии и большие данные для улучшения предоставления услуг. В исследованиях не учитывалась роль аналитики больших данных в построении цифрового общества, которое процветает во времена трудностей. Устойчивость играет важную роль в моделировании государственного сектора будущего, основанного на данных. Таким образом, в этой статье исследуется роль, которую наука о данных играет в поддержке принятия решений правительством, а также в построении устойчивого общества, способного обеспечить устойчивое развитие. В связи с глобальным кризисом в области здравоохранения, который приостановил экономику почти на весь 2020 год, ситуация с пандемией COVID-19 (SARS-CoV-2) также была выделена в качестве наглядного примера того, насколько важны управление данными и их роль в выработке политики и правительственных решений.

Ключевые слова

Государственный сектор, управляемый данными; электронное правительство; цифровая экономика; большие данные; устойчивость; SARS-CoV-2