Exploring digital government transformation: a literature review

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ABSTRACT

This paper presents findings of the literature review on the recent developments of digital government transformation. It aims to inform the current debate about the dynamics and potential impacts of such transformation. The review covers the literature on the topic developed in the past decade, with a special focus on the conceptual transition from eGovernment towards Digital Government and the intervening factors that allowed the use of digital technologies to revolutionise public services, policymaking and public governance. The literature reviewed for this paper confirmed that the barriers and preconditions for a successful digital government transformation are complex and often not technology related. In fact, the introduction of new technologies by governments is always mediated by organisational, institutional, legal, ethical and social factors. Digital technologies may transform virtually every process, system and structure of government, resulting into redefinition of responsibilities and work routines of public officials. Nevertheless, they also create issues and trade-offs that merit careful consideration and preparation before a full-blown change is introduced. In conclusion, to enable to move from eGovernment to Digital Government transformation the application of new emerging technologies is the starting point but should not be considered in isolation from other intervening factors, from their possible combination, and from their specific characteristics.

CCS CONCEPTS

Applied computing → **computers in other domains** → computing in government → *e-government*

KEYWORDS

eGovernment, digital government transformation, ICTs, innovation, service delivery, policymaking, governance

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1. INTRODUCTION

In this paper we present the main findings of a literature review conducted on the recent developments of digital government transformation, which is part of a broader ongoing research on this topic. In fact, the results of the literature review will then need to be corroborated by empirical evidence. The preliminary findings from secondary sources were structured around the key research questions: what was the conceptual transition from eGovernment to Digital Government? What distinguishes digital transformation to other phases? How are transformative

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innovations identified? What other factors influence the transformation, either as a driver or a barrier? What are the key effects expected?

Based on these questions, we structured the literature reviewed in five main chapters. After presenting the methodology, we first introduce the topic with a description of the evolution of the discourse on eGovernment. We present this evolution in terms of four different phases. In the last twenty years, this research field has moved from what is sometimes referred to as eGovernment 1.0 to what recent articles call eGovernment 4.0. We then present the academic debate on the meaning of digital transformation, which is often not defined explicitly nor unanimously in the literature. We conclude that a more precise definition and conceptualisation of this term needs further research and validation. In Chapter 3 and 4, we present the literature focused on the different types of innovations introduced in the public administration and the other relevant factors or antecedents that make the introduction of such innovations possible. Lastly, we focus on the effects of digital government transformation, concluding that research on actual effects and impacts of technology in government still lacks comprehensive and conclusive evidence.

2. METHODOLOGY

We conducted extensive research into recent literature and other secondary sources to identify and define the different dimensions of digital innovations in governments, areas of their potential impacts, as well as the technological trends, antecedents, drivers, and barriers. We applied a combined approach, consisting of several steps. The first and core step consisted of a systematic review of the academic literature.

We included literature published in academic journals using a pre-defined number of databases, and a set of pre-defined research stings. Given the variety of concepts covered in this study, we collected additional sources by using targeted search and a "snowball" approach. This constituted the second phase of our literature review. At both phases (systematic and targeted), the review of academic literature was complemented by desk research to gather relevant non-academic publications. This was especially important given that time for publication of academic literature may result in a couple of years lag, while our research focuses on very recent technological trends.

To carry out the literature review, we operationalised the key themes and concepts into a set of questions, which were used to structure the research and to formulate the search string for the systematic review. It included the following key terms: *eGovernment, digital government, digital governance, digital transformation, smart government, public sector innovation, open government, eDemocracy, service delivery, public service, governance, policy-making, policy-cycle, artificial intelligence, AI, automation, blockchain, machine learning, big data, internet of things, open API, algorithm, predictive analytics, modelling, data use, data re-use, data-driven, interoperability, geolocation, geospatial data, online platforms, ICT-enabled participation, citizens engagement, drivers, barriers, impact, technology, efficiency, effectiveness, inclusiveness, privacy*.

The systematic review of academic literature was conducted in several databases, such as ISI Web of Science, Scopus, Science Direct and SpringerLink. We used a set of inclusion and exclusion criteria to define the thematic scope of literature to be reviewed. The literature that focused exclusively on eGovernment 1.0 was not included in the review at the first stage. However, in some cases, specific articles were used instrumentally to account of the development of the research field. We targeted publications from various disciplines, including public administration, political science, economics and sociology. Given the focus of this study on the new technologies, we also found pertinent articles in sources related to computer science and engineering. We included these sources only when they contained some non-technical considerations and policy implications that were relevant for the analysis.

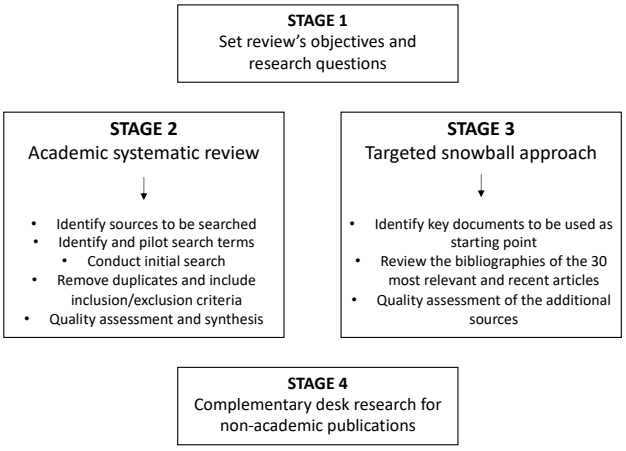

Figure 1 – Steps in the literature review process (Source: authors' elaboration)

3. FROM E-GOVERNMENT TO DIGITAL GOVERNMENT

To start with, we shall discuss the concept of Digital government transformation, which has been broadly defined as the process of implementing ICT-enabled government innovations while transforming the organisational structures, documents and the way services are provided, as well as the overall policy-making and governance systems [1].

Some authors characterise digital government for its use and reuse of data and analytics to simplify transactions for the citizens, businesses, as well as government agencies. It creates information from data to support and enhance the decision-making; it fosters the creation of new, collaborative and more efficient service delivery models [2]. Such transformation reshapes the internal processes and service models as well as the relationship between various levels of government and other social and political actors. Nevertheless, as a research field, digital government is in constant

evolution and has not reached a stage of maturity [3]. Terms such as digital transformation, innovation, eGovernment have been used in a variety of ways and have evolved over time. We propose here a brief excursus of what the literature has identified as the four main phases of the transition from eGovernment to Digital Government. It must be stressed that the linearity of the four phases is a conceptual simplification. It is built on a prescriptive and prospective expectations that are usually not grounded in empirical reality [4]. The policy review that we are currently conducting shows that despite of the emerging interest in Artificial Intelligence and related technologies, national programmes contain many priorities and initiatives grounded in what the academic sources would call eGovernment 1.0 or 2.0. Therefore, the process by which governments have moved towards digitalisation since the late 1990s has been far from linear and its implementation has not necessarily been aligned with the academic discourses.

eGovernment. In the late 1990s and early 2000s, a great deal of research focused on "eGovernment", characterised by the provision of online services and establishment of government websites and IT systems within public administrations. It is also sometimes referred to as e-Government 1.0 – the initial applications of the World Wide Web technology in the public sector, replacing paper transactions. It aimed at internal process innovation to create a government which works well – effectively and efficiently. To achieve this, public organisations started investing into ICTs, but the mode of operation itself remained mostly the same, only the medium changed.

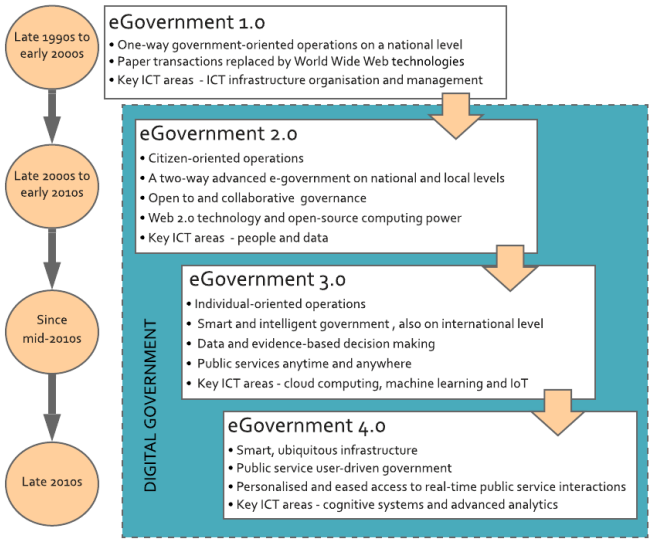

Figure 2 – Evolution of e-Government discourse (Source: authors' elaboration)

eGovernment 2.0. In the second half of the 2000s, the discourse shifted to eGovernment 2.0, also sometimes referred to as "open" or "platform" government. It went hand in hand with Web 2.0 collaborative technologies and aimed at creating an open-source platform in which government, citizens, and innovative companies could interact to improve transparency and efficiency. It was to a great extent an external process (governance) innovation, aimed at increasing participation, collaboration and transparency in two-sided exchanges between governments and the public. The government opened-up for bilateral interactions and gained a new role as a provider of open data, web services, and platforms as an infrastructure [5].

eGovernment 3.0. More recently, since mid-2010s the literature on ICT-enabled innovations in the public sector refer to eGovernment 3.0: the "smart" or "intelligent" government, powered by innovations related to open and big data, administrative and business process management, Internet of Things and blockchain. eGovernment 3.0 should not only function smoothly and be easily accessible to people, but also *think* – with the use of data and artificial intelligence – of better ways to make decisions, solve societal problems, optimise resources and boost citizen well-being and participation. It also covers policy innovation: improving sustainability, affordability and appropriateness of policies [6].

eGovernment 4.0. Finally, the most recent articles have also introduced the concept of eGovernment 4.0 – a fully transformed citizen-driven government, which adapts itself to the needs and expectations of citizens, businesses, non-profit organisations, and other partners, and creates relations and exchanges that are personalised, interactive, and easy to access. Due to these features, the United Nations increasingly sees digital government and specifically eGovernment 4.0 as a tool for building effective, inclusive and accountable institutions to support policymaking and service delivery for the sustainable development goals (SDGs).

4. WHAT IS DIGITAL GOVERNMENT TRANSFORMATION?

Despite the effort to conceptualise the shift from first wave of eGovernment to the most recent discourse of Digital Government Transformation, many of the reviewed sources do not define digital *transformation* explicitly. Nonetheless, the analysis of numerous articles on these topics allows to list the main features of this phenomenon. The term 'transformation' is often used to denote a notable and radical change, modernisation effort or innovation, introducing digital technologies in government's business processes, service delivery models and culture, restructuring how the government performs basic functions and governs. Digital transformation tends to be seen as the process of moving from traditional government through the initial forms of eGovernment towards the Digital Government [7]. It entails introducing the necessary initiatives to make changes deeper in the provision of online services through e-government portals, and into the broader business of government itself. The new, 'transformed', technology-based systems should not only be consumer-friendly, strategy-driven, and capable of providing a better experience for those interacting with the government, but, more importantly, it should also improve the way the government systems operate.

Some authors apply a very specific definition of digital transformation in relation to other types of change in government. For example, Janowski [8] considered digital transformation as one of the stages in the Digital Government Evolution Model. Transformation, according to his definition, implies internal government transformation, but does not affect external relationships and is not context-specific. Other authors, however, use a broader definition of transformation, as encompassing change on all these dimensions. Generally, the digital transformation includes both, (1) transformation of internal processes and (2) transformation of the relationships between governments and other social and political actors, referred to as institutional transformations [9]. Finally, some authors suggest that the aspect of public value is central to evaluation of digital government transformation and related initiatives [10, 11]. This concept covers outcomes, the means used to deliver them, trust and legitimacy, and it addresses issues such as equity, ethos and accountability. Generating public value for citizens through government services depends on the level of quality with which they are delivered, in terms of access, cost, fairness of provision and satisfaction levels. For example, digital services have the potential to empower citizens and broaden their engagement with governments. By digitising, governments also can provide services that meet the evolving expectations of citizens and businesses, even in periods of tight budgets and complex challenges such as income inequality, geopolitical instability, and ageing populations. Increased trust in government – an important theme in digital government research – is also expected to be fostered by digitalisation [12]. These aspects, in turn, have the potential of increasing the resilience of a country's social and economic system, among other positive effects.

However, there is no conclusive empirical evidence that may justify the different definitions or that documents the positive changes and the digital transformation itself [13]. On the contrary, the promised gains seem to have yet to be achieved [14]. A more detailed presentation of the effects is provided in Chapter 7.

5. WHAT TYPE OF INNOVATION?

Academic and grey literature has referred to digital transformation in a variety of ways. At the same time, the sources reviewed offer some useful conceptualisation concerning the public sector innovations and their impacts on government [15]. The literature offers several classifications, some of which can be usefully applied for a better understanding of digital government transformation. We present here nine types of different innovations extracted from several literature sources, which are illustrative of the vast and complex conceptual classification of the term *digital innovation*. The first six types are presented by De Vries et al. [16] in the most recent systematic review of empirically applied studies focusing on public sector innovation. This is complemented by other sources that are more conceptual and general and two additional sources [17, 18] that add interesting elements for what concerns less tangible and more cognitive-normative dimensions of innovation.

1) **Process innovation** refers to the improvement of quality and efficiency of internal and external processes [19]; changes in organizational structures and routines [20];
2) **Administrative process innovation** refers to the creation of new organizational forms, the introduction of new management methods and techniques and new working methods [21];
3) **Technological process innovation** refers to the Creation or use of new technologies, introduced in an organization to render services to users and citizens [21];
4) **Service innovation** refers to the creation of new services or significant improvements to an existing service [20], but also to new users;
5) **Governance innovation** refers to the development of new forms and processes to address specific societal problems [21];
6) **Conceptual innovation** refers to the introduction of new concepts, frames of reference or new paradigms that help to reframe the nature of specific problems as well as their possible solutions [21];
7) **Policy innovation** refers to the changes to thoughts or behavioural intentions underlying policy development [20];
8) **Rhetoric innovation** refers to the new languages and concepts used for the application and use of the emerging technologies and the new forms of organisation and service delivery [17];
9) **Communication innovation** refers to Implementation of a new method of promoting the organization or its services and goods, or new methods to influence the behaviour of individuals or others [17].

In addition to this classification extracted from the literature, we propose another useful compass to distinguish the types of innovations in government. All innovations, regardless of the type, can be defined by two dichotomies: incremental/disruptive and top-down/bottom-up.

Incremental innovations vs disruptive innovations. This dichotomy denotes the degree of novelty and change [22]. The first type refers to gradual improvements of already existing products, processes or services. The second type means the introduction of completely new products, processes or services that come to replace the pre-existing ones. It is important to note that some authors further divide incremental ICT-enabled innovations in public sector into technical and organisational, while transformative innovations are divided into disruptive and radical – the latter being the highest level of change [23, 24]. However, this dichotomy should not be taken statically, as Hacklin et al. [22] present how a convergence of several well-known, incrementally developing technologies can result in innovations with highly disruptive character.

Top-down innovations vs. bottom-up innovations. The distinction stems from the types of actors who initiate the process leading to innovations/changes. While 'the top' refers to

governments or institutions higher up in the hierarchy within government, 'the bottom' denotes the society, business or public employees, civil servants and mid-level policy makers who act as change entrepreneurs [25]. Traditional views on the public value creation focused on the public organisations as sole initiators of the value creation process. The increasing possibilities and the use of digital technologies have been challenging this understanding. By generating new relationships and dynamics, involving actors and resources outside public organisations, and modifying the ways by which the value embedded in the services is produced, ICTs allow for bottom-up control over public services and innovations in this area, as well as empower citizens and other stakeholders to contribute to or lead the creation of public value [26, 27, 28].

Various studies on technological, social, organisational and other types of innovation emphasise that depending on whether an innovation is incremental or disruptive, and top-down or bottom up can significantly affect its development, success, scaling process and transformative effects, among other aspects [29, 30, 31, 32, 33]. Further, most taxonomies of innovation in the public sector are based on the area in which the innovation is introduced. Generally, government innovations enabled by digital technologies can be considered as process, policy or service innovations.

6. OTHER FACTORS OR ANTECEDENTS OF INNOVATION

Public sector innovations are not considered in isolation by scholars, but rather as influenced by several factors or antecedents that may facilitate or impede their evolution [34]. Below we consider the antecedents of innovation that emerged from the review of the broader literature on innovation. Antecedents can either be drivers or barriers depending on any specific configuration (of their presence/absence and of the context-specific factors).

Innovation level (intrinsic attributes). The traditional innovation literature inspired by Rogers's innovation diffusion theory [35] focus mainly on the intrinsic attributes of innovation. These attributes are: a) relative advantage: successful innovations must show that adoption has more advantages compared to business as usual (in terms of economic return, but also of social prestige, convenience and satisfaction); b) compatibility: the innovation must be compatible with existing practices and values and with the needs of potential adopters; c) complexity: innovations perceived as less complex are more likely to be adopted; d) triability: possibility for innovation to be piloted on an initial limited scale. Rogers's approach, however, presents also a number of limitations. The intrinsic attributes of innovation are relevant to consider in the conceptualisation of Digital Government transformation, but they have to be integrated with the other dimensions.

Organisational level. The seminal contribution shedding light on the organisational dimension of innovation is Damanpour [36], who stressed in particular availability of slack resources (money, time, technology, skills, employees), complexity and functional differentiation, and the origin of professional knowledge. Larger organisations which are more structurally differentiated and with slack resources were thought to more likely be adopters of innovation. Empirical studies and meta-reviews bring important but non-conclusive evidence on the explanatory power of such dimensions. In other words, they explain some of the variations in innovation diffusion but not all of them [37]. Softer dimensions include organisational processes and culture. As early as 1975, a seminal empirical work found that innovation pilots projects were almost all successful in their limited area but failed to spread or be accepted due to wider organisational resistance [38]. The author concluded that success of innovation must be understood in terms of choices and social processes within the inner-organisational context. This also encompasses the consideration of antecedents such leadership, of capacity for organisational processes to absorb new knowledge and practices, as well as of organisational culture and incentives [39].

Environmental level (external context). Innovations are locally embedded and result from the co-evolution between different demands/needs and related pressures that stem from different but closely related environments. Innovation is also embedded in social and institutional contexts and influenced by inter-organisational and inter-personal networks and communication channels. If originally innovation was seen as a discrete event resulting from knowledge developed by isolated actors, the insights of inter-organisational networks studies have led to consider innovation as the result of a process based on the interactions and exchanges of knowledge among different interconnected organisations. This aspect is related to the notion of institutional isomorphism, a process that leads organisations in the same field to become more similar as defined by Di Maggio and Powell [40]. Institutional isomorphism is a process of "convergent inertia or change", whereby organisations do or try to do what is considered legitimate in their own institutional environment. In order to become legitimated in their environment, organisations tend to replicate the routines and action templates of those organisations that are considered the most successful and legitimated.

Individual level (innovators/employees). At the individual level, important antecedents are the presence of intrapreneurs that can overcome risk-averse cultures, empowered and motivated employees, commitment and shared values, and availability of skills related to the technical nature of the innovation introduced. Hence, as observed by De Vries et al. [41], agents play an important role in enabling innovation both at the organizational level (focus on leadership) and the individual level (where there is a strong focus on innovative employees and their characteristics).

The discussion in the literature of these dimensions aims to show that the application of new emerging technologies is only the starting point to move from eGovernment to Digital Government transformation. However, this is not considered in isolation from other factors, from their possible combination, and from their specific characteristics. Full digital transformation most likely occurs through the combination of different technologies and innovations since the value of digital transformation is less about the tools used in the delivery of services, and more about the way in which governments can engage with their users to gather their

insights and subsequently design responses to best address their needs – as enabled by an increasing ubiquity of affordable personal technology and a wealth of data.

7. THE EFFECTS OF DIGITAL GOVERNMENT TRANSFORMATION

The synthetic overview of the empirical evidence, as well as of the more prospective and prescriptive arguments, on the effects presented in the literature allows to distinguish between three very general groups of effects of the applications of the most recent digital technologies in government, as presented in this chapter.

Efficiency and productivity gains, cost-savings. Applications of ICT allow in principle to save public resources or to allocate them more efficiently. The body of literature on the economics of ICT in the public sector provide probably the most conclusive evidence on actual (rather than *expected*) outcomes of digital technology applications. Effects such as reducing operational and labour costs in public administrations, allowing staff to focus on more important tasks, making service delivery faster and cheaper and so on, are more immediate and comparatively easier to measure as compared to the effects on, for example, government accountability or inclusion. For instance, AI is a powerful tool that can understand, monitor, reason, predict, interact, as well as learn and improve responses overtime, potentially replacing many tasks carried out by humans [42]. This, however, does not necessarily lead to job losses because the automation and digitisation of government processes could lead to a significant reconfiguration of work and employment patterns [43, 44]. Often public administration report labour saving from automation that enable redeploying staff to core task and other tasks. Yet, given less flexibility for government to deal with employees and redeploy them to new jobs and that employees involved in routine task being routinised do not possess the skills to perform other more interactive or cognitive advanced tasks, the possibility of lay off cannot be ruled out [45]. The above can be offset if public sector employees are retrained to acquire those skills needed to be part of digital government transformation. This would, at the same time reduce the risk of job loss and cope with the barrier for full adoption of AI and exploitation of the potential of the emerging technologies represented by lack of skilled workforce in public administration.

Effectiveness and quality improvements. In addition to making things cheaper, technologies also allow to make them better. Most of the reviewed sources highlight – directly or indirectly – the effectiveness and quality of public sector operations, functions and services as a result of digital innovations in government. Through more accurate predictions, real-time detection and tracking, improved resource allocation, better decision making, and personalised context-aware and context-smart services, AI and other discussed technologies, governments can develop better-functioning and more inclusive and empowering services and policies. These, in turn, improve user satisfaction and solve problems of collective action. For instance, several authors highlight how predictive analytics allow the public sector to focus more on prevention, instead of just reaction to societal problems. These tools have been applied in developing targeted, personalised interventions and 'nudges' in healthcare, education and other social services of general interest. Police departments use predictive models to decide where they want their officers to patrol, while data mining and network analytics help to discover tax fraud [46]. Advanced analytics using AI and big data give policymakers the ability to test the potential solutions in advance. This provides an opportunity for testing policy options and unintended consequences before undertaking a policy measure [47]. AI and machine learning may improve budget allocation methods, and big data analysis helps to identify areas that need funding first and foremost. Lastly, AI-based policy assessments in real-time should allow for rapid policy evaluations. This, in turn, should equip public servants with robust assessments of operational performance, and better understanding of policy effects [48].

Transparency, accountability, trust and legitimacy. The outcomes of digitalisation in terms of more trustworthy governments and stronger democratic processes are also touched upon in the literature [49] – although they are covered to a lesser extent and supported by weaker evidence. The definition of the impacts and their measurability in this dimension remains vague and fragmented. While many sources point to several possible negative side effects (e.g. increased surveillance and lack of privacy), it is generally expected that better outputs of the government – in terms of administrative effectiveness, public services and daily interactions between citizens and public administration – should lead to further transparency, accountability and, ultimately, greater legitimacy. Given such a long causal chain, these effects are even more difficult to evaluate empirically. Nonetheless, they remain one of the core expectations from digitalisation in the public sector. For instance, some authors [50] argue that blockchain technology can make government activities more transparent, potentially enhancing trust in public authorities, without the creation of virtual states. Moreover, opening of data, applications of AI and other digital technologies in public administration can lead to increased transparency in at least three ways [51]. Firstly, transparency of decisions made by public servants due to more data open to the public. Second, increased transparency may also result from more effective policy implementation, especially in the areas of taxation and payments. Third, new governance paradigms can reshape the citizen-administration relationships [52]: from impartial application of rules and regulations by administration to exercise its authority over citizens (bureaucratic paradigm), through provision of public services by administration to fulfil the needs of citizens (consumerist paradigm), to responsibility-sharing between administration and citizens for policy and service processes (participatory paradigm) [53, 54]. However, it remains unclear whether will this last point can lead to greater social inclusion. On the one hand, digital technology is seen as enabler of more direct participation in democratic decision making, as mobiliser of greater participation from individuals with traditionally lower political engagement [55], and as enabler of

access to services that were previously out of reach for certain groups [56]. On the other hand, it is questionable whether digital technologies in fact increase and broaden citizen participation in democratic processes (instead of simply substituting offline engagement or facilitating deeper engagement of those already active).

For all the three dimensions of effects of digital government transformation, the majority of authors agree that there is a problem of measurement. Measuring digital government transformation in terms of actual change introduced by ICT-driven innovations remains a challenging task. For example, through a systematic literature review on innovation in the public sector published between 1990 and 2014, De Vries et al. [57] found that 40% of studies did not report outcomes and that many articles focused on the positive effects of innovations. They concluded that innovation is often considered as a value in itself. Even though our literature review focusses on more recent research, we observed very similar trends. First, the research on actual effects and impacts of technology in governments still lacks comprehensive and conclusive evidence, and the reviewed literature – even the most recent articles – still discusses the transformative effects rather theoretically and normatively. Second, the image of digital government transformation is often framed simply as the introduction of digital innovations, which are seen as a value or a positive development in itself. Fewer sources cover transformation in terms of outcomes caused by these innovations – which are also much more often incremental rather than disruptive. Related to this, the majority of reviewed sources are generally positive about the current and future impacts of digital transformation. Since the lack of innovations (especially of disruptive ones) is framed as the main problem, fewer sources generally talk about actual and potential problems caused by biased algorithms, insufficient data protection or privacy violations [58].

8. CONCLUSION AND FURTHER RESEARCH

The literature reviewed confirmed that the preconditions for a successful Digital Government transformation are not only confined to technological matters. Many of the articles reviewed suggest that the introduction and adoption of new technologies by governments is often impeded by organisational, institutional and legal barriers. This is explained by the fact that the new technologies are expected to challenge virtually every process, system and structure of government. However, these changes are complex and require radical transformations. The transformation aspect is often considered in the literature to be the ultimate goal of eGovernment development and implies a shift from digitalising public services to a larger scale reform of the government. In order to sustain this transformation, multiple processes of change and redesign need to be in place – not only of the organisational processes involved, but also of regulatory and institutional aspects, such as changes to the law and in the discretion and work practice of public officials.

However, the main findings presented in this paper will have to be corroborated with empirical evidence. In particular, our assumption that the real potential of the various technologies and of the innovation they enable springs from their combination and aggregation. In other words, we expect that a transformative innovation that combines the introduction of different technologies across different sectors would deliver more effects than a gradual improvement of a service. However, this is an assumption that needs empirical testing and will need further research on the topic.

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DISCLAIMER

The views expressed in this article are purely those of the authors and may not be regarded as stating the official position of the European Commission.

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