Digital Government Transformation: A Structural Equation Modelling Analysis of Driving and Impeding Factors

https://doi.org/10.1016/j.ijinfomgt.2021.102356

Abstract

Digital technologies are transforming the public sector by affecting applications, processes, culture, structure, and civil servants' responsibilities and tasks. Yet, there is a void in research about driving and impeding factors influencing digital government transformation (DGT). The article contributes to the current debate on DGT by quantitatively assessing the transformation and its driving and impeding factors. The analyses were performed by collecting and analyzing through structural equation modeling 491 answers to a survey to Italian administrations. Results show that DGT is influenced by a combination of different factors, including the sense of urgency, the need for change, and the creation of a collaborative environment, suggesting that more effort is required for including public managers in the current debate on DGT. Organizational barriers and lack of support are impeding factors. Finally and counter-intuitively, resistance to change was not found to impede the transformation.

Keywords: e-government, digital transformation, t-government, enablers, barriers

1 Introduction

To fully leverage the potential of digital technologies, public organizations need a profound rethinking of the institutional and organizational assets of traditional governmental structure (Nograšek & Vintar, 2014). Digital technologies are nowadays triggering significant organizational changes: governments need to be properly organized for achieving better

operational performances (Ashaye & Irani, 2019). Such a transformation process, which is occurring in the public sector as well as in the private sector, is labeled under the term '*digital transformation*'. From the organizational point of view, digital transformation refers to a complete redesign of the existing processes, procedures, structures, and services for making new digital technologies institutionalized and routinized into the organization (Tassabehji et al., 2016; Vial, 2019). Newer technologies require different management skills, competences in governing the change, and organizational and inter-organizational structures (Yildiz, 2007). Often the use of these technologies requires a radical change, asking for a disruption of the *status quo* and the standard operating procedures by experimenting and iterating with technologies that are not part of the standard toolkit of the public and private organizations (Nograšek & Vintar, 2014; Vial, 2019).

When approaching this transformation in the public sector, scholars labeled this phenomenon as 'transformational government' (abbreviated as t-gov). T-gov is viewed as the second stage of e-government (Omar et al., 2020), where the transformation enabled by digital technologies covers organizational and socio-technical aspects, embracing a change in the structures, operations, and culture of government as opposed to a mere introduction of digitized procedures (Omar et al., 2020). Recently, public sector scholars introduced the concept of digital government transformation (DGT) following the need for a more precise term for defining such transformation (Curtis, 2019; Mergel et al., 2019) that emphasize the 'the cultural, organizational, and relational changes' in public organizations (Mergel et al., 2019, 12). Such a terminological shift is set in the path traced by the business scholars who first started referring to digital transformation (Hanelt et al., 2020; Vial, 2019).

From an organizational perspective, the literature on DGT and t-gov share important similarities. DGT and t-government can be considered as an evolution of a mere employment of digital technologies, whereas the latter is focused on digital technologies resulting in a

change within the organizations (Omar et al., 2020; Vial, 2019). DGT reflects the complexity of the disruptive impact of digital technologies on individuals, organizations, and society (Curtis, 2019; Mergel et al., 2019).

Some studies explore transformational efforts being undertaken by governments on all levels (Pedersen, 2018; van Veenstra et al., 2011; Weerakkody et al., 2012; Weerakkody & Dhillon, 2008), whilst others highlight a lack of empirical evidence that such transformation has actually taken place (Coursey & Norris, 2008). Several authors argued that the inability of governments to pursue a transformation is the reason behind most failures (Omar et al., 2020). Moreover, literature is so far mainly based on case studies, lacking quantitative evidence assessing on a large scale the depth and the width of DGT (Omar et al., 2020).

Several impediments complicate DGT. Literature provides overviews and categorizes them in different ways (see for example Al-Emadi & Anouze, 2018; van Veenstra et al., 2011). Moreover, managers play a leading role in this transformation process, hindering or fostering the change, depending on how carefully they plan and implement change management activities (Ashaye & Irani, 2019). However, a comprehensive framework that includes and tests at the same time barriers, managerial actions, and the impact of digital technologies on organizational transformation is still missing.

This paper aims at integrating the existing body of literature on DGT with a new perspective that, after introducing a clear definition of the concept of DGT, tackles a comprehensive perspective of the phenomenon, detailing the factors the trigger and block this transformation process.

For doing that, we designed a model and delivered a survey to all Italian public organizations, collecting 506 responses. We performed a robust quantitative analysis adopting Structural Equation Modelling (SEM) methodology.

Results show that DGT is hindered by organizational barriers but not by cultural barriers. Finally, managerial activities, especially the definition of a vision, the design of a plan, and the involvement of the employees, turned out to be extremely relevant.

This paper is organized as follows. Section 2 reviews the literature in the field and proposes the hypotheses and the conceptual model for looking at DGT. Section 3 illustrates the methodology. Section 4 contains the results, which are discussed in Section 5. Finally, conclusions are drawn in section 6.

2 Literature review

The literature review section reports the elements that characterize DGT. Those elements were reviewed and then included in the research framework. First, we define and characterize the concept of DGT, looking at different streams of literature. We link the concept of digital transformation with the concept of organizational transformation (as a common practice in the existing literature, see for example Hanelt et al., (2020)). Second, we identify and categorize the barriers that can hinder DGT. Third, building upon the premise that managers play a pivotal role in fostering the change (Mergel et al., 2019; Vial, 2019), we revise the literature on managerial activities and include this element in the final framework.

2.1 DGT definition and key concepts

Transformation is enabled by technology developments but has a profound influence on the organizational and social elements (Venkatraman, 1994). Organizations are complex socio-technical systems that can be viewed as the ensemble of five different elements: process, people, culture, structure, and information system (Bostrom & Heinen, 1977). Those five elements compose two independent but interactive macro-systems (Bostrom & Heinen, 1977):

- the *technical* system, which includes those elements that are necessary to transform input into output (process, tasks, duties, information system);
- the *social* system, which includes those elements that are related to the environment the technical system is embedded in, the organizational culture and values, and the authority structure.

Every transformation must consider both the technical and social systems (Bostrom & Heinen, 1977). Digital technology investments must be accompanied by changes in all organizational features to fully exploit the benefits derived from their usage (Nograšek & Vintar, 2014; Venkatraman, 1994).

In the public sector literature, the need for such transformation was often labeled under the term t-gov. T-gov is defined as (Weerakkody, Janssen, and Dwivedi 2011, 321) "the ICT-enabled and organization-led transformation of government operations, internal and external processes and structures to enable the realization of services that meet public-sector objectives such as efficiency, transparency, accountability and citizen centricity". T-gov scholars argue that public organizations for leveraging the potential of digital technologies and reaching a full digital maturity must go through a transformation process (Weerakkody et al., 2011; Weerakkody & Dhillon, 2008) and only through this transformation they can fully benefit from the introduction of digital technologies (Weerakkody & Dhillon, 2008) and avoid failure of digital technologies' introduction projects (Weerakkody et al., 2011). Therefore, new organizational structures, processes, and resource allocations should be taken into account when adopting and implementing new digital applications (Omar et al., 2017b).

Recently, scholars started arguing that this transformation process led by digital technologies is becoming more pervasive in public organizations and digital technologies are becoming key enablers of *second-order*, radical changes (Scholl, 2005) that, according to Levy (1986),

are those that take new directions, are irreversible, and result in a new state of things. To highlight this, some scholars suggest following the school of thought of private sector literature and start adopting the term DGT (Curtis, 2019; Mergel et al., 2019).

In fact, while the literature on digital transformation in business is quite extensive (Vial (2019) identified 282 papers until June 2018, Hanelt et al., (2020) identified 279 papers until the end of 2018 but only in the management field), the literature on DGT is still scarce (Curtis, 2019; Gong et al., 2020; Mergel et al., 2019; Pittaway & Montazemi, 2020). As reported in Figure 1, a quick research on the Scopus database on DGT combining the keywords "digital transformation" together with "government" and "public sector" shows that nowadays only 38 articles explicitly refer to DGT[1] of which only 4 were published before 2019, highlighting the novelty of this research stream. Moreover, 32 use qualitative methods, leaving a gap for quantitative studies.

[FIGURE 1 AROUND HERE]

The novelty of the DGT literature stream contrasts with the use of DGT as a buzzword, adopted by scholars and practitioners without clarifying its meaning (Mergel et al., 2019). Hence, a definition is needed. Referring to the concept of transformation (Levy, 1986) and using insights from t-gov and digital transformation in business, we define DGT as:

[1] The queary used is *TITLE-ABS-KEY(("digital transformation" and ("government" OR"public sector")) or ("digital government transformation")) AND (LIMIT-TO (DOCTYPE,"ar").* Screening the abstracts, and eventually the full text of the resulting list of papers (148) the majority were excluded because they were not directly related to DGT but instead referred to governments as part of the ecosystem that support or hinder digital transformation in businesses. Last update 30.11.2020.

> *'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.'*

The definition integrates: (i) the concept of radical change as defined by Levy (1986) when referring to transformation, (ii) the elements that compose an organization as identified by Bostrom and Heinen (1977), and (iii) the role of digital technologies and their effect on the organization, as identified by the literature on t-government and digital transformation in businesses (Omar et al., 2020; Vial, 2019). The proposed definition aims at filling a terminological gap in the actual body of literature on DGT (Mergel et al., 2019). Our definition includes the necessary conditions for referring to digital transformation. At the same time, due to the complexity of public organizations and their relationships, it does not claim to exhaustively list all the organizational aspects that are expected to be affected by such transformation.

Such changes lead to a complete redesign of the information systems and deeply impact organizational processes, people, culture, and structures (Al-Emadi & Anouze, 2018; Nograšek & Vintar, 2014; Weerakkody et al., 2012, 2019). Thus, as reported in Table 1, all those areas must be covered when assessing DGT. DGT requires a rethinking of employees' skills, responsibilities, competences, and the overall structure of an organization as well as the endorsement of different working values, both collectively and individually (Vial, 2019).

The need of pursuing such transformation is also confirmed by several articles that argue the urgency of adopting a business process management approach when pursuing DGT (see for example Fischer et al., 2020; Weerakkody et al., 2011). The business process management

approach also includes core transformation elements in all five aforementioned organizational areas (see Table 1) (Fischer et al., 2020).

Despite the need for such transformation, a previous study (*xxx – details omitted for anonymous review*) conducted in the Netherlands, shows that so far in public organizations those five areas are not all equally impacted: while the technical system is often changed by the developments of digital technologies, the social system is less affected. This raises the question of whether a DGT is in fact happening.

[TABLE 1 AROUND HERE]

2.2 DGT Barriers

When approaching DGT, several barriers can come about and hinder the change (van Veenstra et al., 2011; Vial, 2019). Literature divides these barriers into two categories: *organizational and cultural barriers* (Al-Emadi & Anouze, 2018; van Veenstra et al., 2011).

Organizational barriers are related to the management and the complexity of the organizations. Exploring three cases of public organizations, Ashaye & Irani, (2019) demonstrate that political will influence DGT. Moreover, support from top management is often considered a necessary condition for transformation (Haneem et al., 2019). Moreover, lack of coordination between divisions (Ebrahim & Irani, 2005; Weerakkody et al., 2019) can hinder change. Hence, we hypothesize that:

H1. Organizational barriers negatively influence DGT

Cultural barriers refer to the fear that the innovation threatens the employees' position, as they lose control of the process (Meijer, 2015) or they lose their job (Ashaye & Irani, 2019).

Moreover, resistance to change coming from employees within the organization (Al-Emadi & Anouze, 2018; Ashaye & Irani, 2019; Weerakkody et al., 2019), and bureaucratic culture (Meijer, 2015; van Veenstra et al., 2011) act as barriers for DGT (Ashaye & Irani, 2019; Weerakkody et al., 2019). Hence, we hypothesize that:

H2. Cultural barriers negatively influence DGT

Several studies made an effort of identifying and classifying existing barriers (see for example Al-Emadi & Anouze, 2018; Ashaye & Irani, 2019; van Veenstra, Klievink, et al., 2011), however, those studies are mainly theoretical or based on case studies, leaving a gap of the quantitative studies that collect this body of knowledge and test it on a large scale (Omar et al., 2020).

2.3 Managerial activities for DGT

The literature on organizational change stresses the role of public managers (Fernandez & Rainey, 2006; Tassabehji et al., 2016). Their role is also significant according to the DGT literature (Ashaye & Irani, 2019; Mergel et al., 2019; Tate et al., 2018); corroborating evidence that is also highlighted by the researches in the private sector (Evans & Price, 2020; Vial, 2019).

The role of the manager is to implement a series of actions for changing the organizing logic (Sambamurthy & Zmud, 2000), starting from ensuring the need for change and clarifying the vision (Cegarra-Navarro et al., 2012; Fernandez & Rainey, 2006; Kickert, 2014; Kuipers et al., 2014). Ashaye & Irani (2019) highlight how those activities remain extremely important when introducing digital technologies. Moreover, DGT requires a high degree of flexibility in planning the transformation process, for overcoming unplanned impediments (Cavalheiro & Joia, 2016; Cordella & Tempini, 2015). Finally, managers must ensure the involvement of all actors that will be affected by the change (Svahn et al., 2017), and arrange information and

training activities (Borman & Janssen, 2013; Jones, 2012). Table 3 provides a list of activities for managing organizational change when introducing new digital technologies.

First, we expect that the effective implementation of those management activities will help to overcome DGT organizational barriers. Managers who handle the change with activities, such as the communication of a clear vision and the definition of a proper strategy (including short and long terms goals), are expected to foster commitment and ensure coordination. Hence managerial activities are expected to mediate the effect of the organizational barriers (Fernandez & Rainey, 2006). We hypothesize that:

H3a. Managerial activities soften the effect of the organizational barriers

Second, a similar argument can be brought forward for cultural barriers. Managerial activities, such as clarifying the vision, and involving the actors from the start, are expected to mediate the effect of the cultural barriers (Fernandez & Rainey, 2006; Nograšek & Vintar, 2014). If employees perceive their involvement as change agents, their commitment is expected to increase, thus they will probably show less resistance or fear towards the change (Fernandez & Rainey, 2006). Hence, we hypothesize that:

H3b. Managerial activities soften the effect of the cultural barriers

Finally, we expect that managerial activities will directly affect DGT. Public managers are leading the transformation (Nograšek & Vintar, 2014; Vial, 2019). Their activities are expected to lay a fertile ground for pursuing DGT (Fernandez & Rainey, 2006; Vial, 2019), supporting the organization's transformation. Hence, we expect that organizations with a strong and careful introduction of proper managerial activities that accompany and support the transformation have more possibilities in pursuing DGT. We hypothesize that:

H4. Managerial activities positively affect DGT

So far, scholars characterized DGT as fostered and/or hindered by the factors that can or cannot exist within or outside of the organization, such as IT-skills (van Veenstra et al., 2011), an adequate number of employees (Ebrahim & Irani, 2005), or pressure from outside (Mergel et al., 2019). However, managerial activities can influence DGT (Fernandez & Rainey, 2006). The presence of proper managerial activities is rarely taken into consideration when assessing DGT (Al-Emadi & Anouze, 2018). We, therefore, include the managerial activities for transforming (i.e., *what an organization does* for transforming), as a factor that can (at least partially) explain DGT.

2.4 Organizational dimension

As a control variable in our conceptual model, we add the organization dimension "number of employees". On the one hand, smaller organizations seem to have more difficulties in introducing new digital technologies (Budding et al., 2018). On the other hand, internal processes and organizational structure are often more simple; thus, they can more easily pursue a DGT (*xxx – details omitted for anonymous review*). Hence we hypothesize that:

H5a. Organizational size negatively influence DGT

Moreover, in a smaller organization, organizational barriers are expected to be less present. Such organizations, having a limited number of employees, also have a simpler internal structure, with a limited number of departments and a flatter hierarchy. Thus we hypothesize that smaller organizations have simpler coordination within the own organizations and simpler communication with politicians and top management (i.e., the organizational barriers). We hypothesize that:

H5b. Organizational size positively influence organizational barriers

Following a similar argument, bigger organizations are expected to need more bureaucratic work, having standard procedures embedded in the organizational culture (Weerakkody et al.,

2019; *xxx – details omitted for anonymous review*). Thus, resistance to change, bureaucratic culture, and fear of innovation, i.e., the cultural barriers, are expected to be positively impacted by an organization's size. Hence, we hypothesize that:

H5c. Organizational size positively influence cultural barriers

2.5 Resulting Conceptual model

Figure 2 represents the conceptual model extracted from the literature (hereinafter called "DGT framework"). The DGT framework will be used to test if barriers have a direct effect on DGT (H1-2), if the management plays a pivotal role, being able to break down barriers (H3) and influencing DGT (H4), and finally, if organizational size affects those results (H5).

[FIGURE 2 AROUND HERE]

3 Research Methodology

A questionnaire was developed to collect data from Italian public managers to test the DGT framework. The questionnaire consists of just two sections, which should allow respondents to easily understand the questionnaire and reduce the response time. Section A includes the questions related to the conceptual model. Three categories of questions were defined: category 1 consists of 5 questions that aim at measuring the dependent variable, i.e., DGT. Category 2 consists of 6 questions to measure the barriers. The last category consists of 6 questions to measure the effectiveness of managerial activities.

Section B asks demographic information in the form of multiple-choice questions. The section investigates the characteristics of the administration, such as the type of

administration, number of employees, as well as the characteristics of the respondent such as age, education, and work experience. The questionnaire included a summary at the beginning to explain the purpose and importance of the study. The entire questionnaire is reported in Appendix A.

Before sending the survey, a pilot test was conducted by interviewing four public managers to verify the intelligibility and completeness of the questionnaire. After that, the questionnaire was revised and a second pilot test was conducted with another Italian public manager to validate the changes. The survey was sent through the official and public e-mail addresses of each public organization. The analysis was conducted between January and May 2020. At the beginning of February and April, two recalls were sent to increase the number of respondents. A total of 506 responses were collected; after excluding responses with missing data, the usable sample size was 491. Table 2 and Table 3 show the characteristics of the sample.

The statistical analysis was conducted using Structural Equation Modeling (SEM) with IBM SPSS Amos version 25. Before testing the hypotheses, a confirmatory factor analysis (CFA) was employed to verify the reliability of the constructs (Anderson & Gerbing, 1988).

[TABLE 2 AROUND HERE]

[TABLE 3 AROUND HERE]

4 Results

4.1 Testing constructs normality

Normality was tested using Pearson's Skewness and Kurtosis parameters. The results (see Table 4) indicate that all values of the variables were within the acceptable range (−2.58; +2.58) (Hair et al., 2010). Thus, data is normally distributed.

[TABLE 4 AROUND HERE]

4.2 Confirmatory factor analysis (CFA)

Before testing the hypotheses, a confirmatory factor analysis (CFA) was executed to verify the reliability of measures. Expected indexes for good measurement are at least 0.5 for average variance extracted (AVE) (Fornell & Larcker, 1981) and at least 0.7 for composite reliability (CR) (Hair et al., 2010). All indexes are acceptable, which indicates good convergent validity. Moreover, all factor loadings exceed 0.5, and each indicator is significant at least at the 0.05 level. Table 5 resumes the adequate reliability and convergent validity of all sub-constructs. Moreover, the indicators' loadings of all constructs are above the recommended value of 0.60 (Hair et al., 2010).

[TABLE 5 AROUND HERE]

The overall model fit of the measurement model is found to be good: chi-square/df=1.892, CFI=0.974, TLI=0.968, SRMR=0.045, RMSEA=0.043, PClose=0.896.

Finally, the criteria for discriminant validity have been met (Table 6) (Fornell & Larcker, 1981). The square root of AVE for each construct exceeds the correlation with other constructs.

[TABLE 6 AROUND HERE]

4.3 Hypotheses testing: results of the structural model

The overall model fit of the measurement model is found to be good: chi-square/df=2.144, CFI=0.964, TLI=0.955, SRMR=0.044, RMSEA=0.048, PClose=0.623.

Figure 3 and Table 7 present the results of the structural model. Managerial activities turn to be the best predictor for organizational transformation.

On the one hand, organizational barriers are confirmed to hinder DGT and are often, though sometimes only slightly, affected by managerial activities. On the other hand, no significant effect is registered to be triggered by cultural barriers. Neither they obstruct DGT nor they influence the managerial activities.

Finally, the control variable, i.e. the dimension of the organization, does not have any direct effect on DGT, whereas bigger organizations experience higher barriers, both organizational and cultural. No other control variables of the questionnaire were included in the resulting model, as they did not have any significant effect on any construct.

[FIGURE 3 AROUND HERE]

[TABLE 7 AROUND HERE]

5 Discussion

The analysis offers new insights into DGT and the factors that enable or block it. Table 8 summarizes the main findings of this research.

[TABLE 8 AROUND HERE]

The descriptive statistics (Table 5) show that the introduction of digital technologies only partially transformed public organizations. While digital technologies are nowadays transforming the technical system of an organization (information systems and processes), the social one has a lower level of transformation. Yet, studies show that the full benefits can only be reaped if the social system is also transformed (Ashaye & Irani, 2019; Borman & Janssen, 2013; Nograšek & Vintar, 2014). For example, Borman & Janssen (2013) showed that the success of e-government implementation in a public organization in Australia was determined by a change in the structure. A similar finding was also found in UK public sector by Omar et al., (2017a). Furthermore, Ashaye and Irani (2019) highlight the importance of a cultural change.

Following the terminology proposed by Mergel et al. (2019), the study shows how over the past years public organizations went through a *digitalization* process, i.e., a change of existing processes, whereas *DGT*, which emphasizes cultural and full organizational change, is still undergoing. These results were similar to the ones obtained in a previous study in the Netherlands (*xxx details omitted for anonymous reviewers*), highlighting that the same trend

can be found in countries having very different dimensions, institutional characteristics, and pervasiveness in the usage of digital technologies in public affairs (for this feature we referred to the last benchmarking analysis by the European Commission (2020)).

All structural model results suggest the same direction: the pivotal role of the management and the activities that they put into action for fostering DGT. In fact, the main and most significant effect that explains the transformation is the effective usage of change management techniques for transformation (H4). This result confirms with a quantitative test the relevance of a 'good' leader that champions the change (Ashaye & Irani, 2019). Moreover, the only relevant barriers are the organizational ones, i.e., the absence of support and coordination between the departments (H1). These results confirm previous qualitative studies that affirm the importance of seeking support from politicians (Ashaye & Irani, 2019) and top management (Haneem et al., 2019). Managerial activities, behind the direct effect on the transformation, can tear down or at least diminish those barriers.

Finally, and opposite to our initial expectations, cultural barriers do not have any relation with DGT. The descriptive statistics (Table 5) show a strong presence of cultural barriers (all of the three barriers have a mean above 3 out of 5). However, when looking at the correlation, DGT is not related to those barriers. Thus, we can conclude that cultural barriers are not differential, organizations change independently from the incidence of those barriers, extensively present in the majority of the public organizations.

Moreover, while so far scholars mainly reflected on the barriers that obstruct DGT (see for example, Al-Emadi and Anouze 2018; Meijer 2015; van Veenstra, Klievink, and Janssen 2011), literature on the change management activities that can facilitate DGT is still scarce. Despite that, our quantitative analysis shows that those activities play a central and pivotal role, claiming the urgency of further analysis in this direction.

Combined with the results obtained by (*xxx details omitted for anonymous reviewers*) in the Netherlands, we can hypothesize that what drives DGT is the sense of urgency that comes from outside the organization, like obligations or pressure from other institutions or final users (*xxx details omitted for anonymous reviewers)* and the presence of a 'good' management that defines and executes proper change management activities. If those conditions are met, the organization changes independently from the resistance by its employees.

This result seems to be partially in contrast with previous qualitative studies (Al-Emadi & Anouze, 2018; van Veenstra et al., 2011; Weerakkody et al., 2019). However the different settings and above all the different methodology can help in explaining it. We treated the organization as a whole as the object of research, overlooking its inherent internal dynamics and complexity for the sake of cleanness of the quantitative measurement. Hence, our results do not exclude that in a single transformation project cultural barriers hinder the change. Moreover, we delineate the analysis in the Italian context and even though similar results were found in a previous study carried out in the Netherlands (*xxx details omitted for anonymous reviewers*), suggesting the possibility to explore generalization, we did not collect evidence from other countries.

Finally, organizational size seems to matter. Several studies demonstrate that smaller organizations have more difficulties in introducing new technologies (see for example Budding et al., 2018). Our results show that smaller organizations can more easily pursue DGT. Smaller organizations suffer fewer organizational barriers, such as lack of coordination and support, and as such, they have an easier path for transforming.

5.1 Theoretical contribution

After reviewing the existing literature, the paper proposes a DGT framework. This analytical framework helps to understand how digital technologies are transforming public organizations, and, especially, which factors influence DGT. The paper contributes to the underdeveloped field of study of DGT, adding (i) a definition of DGT and (ii) quantitative evidence that complement existing theoretical and qualitative studies. It assesses a series of elements that were expected to foster or block DGT, from cultural and organizational barriers to managerial activities. Moreover, the paper stresses the role of management as a leading factor for DGT.

Finally, this research positions DGT at the intersection of different literature streams, e.g., t-government, organizational change, change management, and digital transformation in the private sector. Our findings show that these streams must be taken into account when approaching DGT. We encourage scholars to pursue this process of 'positive contamination' between different schools of thought.

5.2 Implication for practice

The results highlight that so far, the introduction of digital technologies only partially transformed public organizations, whereas DGT has become even more urgent nowadays. The current situation due to COVID-19 has made such transformation obligatory for all sectors (Fletcher & Griffiths, 2020).

Higher levels of DGT might be needed to take full advantage of the potentialities of digital technologies. A transformation of organizational structures, culture, and responsibilities is expected to be a necessary condition for accomplishing real DGT. Our research suggests the transformation of the organizational culture is often missing or it often follows after having transformed the technical system. Managers can speed up transformation by focussing on

pursuing a cultural change earlier. Moreover, results show that the organizational structure is hardly affected by DGT. Changing the contents without changing the container is one of the main limits of the undergoing transformation process. Thus organizations should focus on transforming the structure earlier.

Our results suggest that top management and politicians should invest in the identification of a proper leader that could champion the change. Leadership competencies and attitudes, hence the managerial activities that the leader puts into action, play a pivotal role. Thus top management and politicians shall carefully select, monitor, and evaluate the person or group of persons that lead DGT. Our findings provide insight on *what* the leader should do for ensuring transformation. The leader shall be able to put into action proper change management activities, such as to instill the urgency and need of changing the *status quo,* addressing short-term and long-term goals, and involving all employees by promoting participation.

Finally, also the obtained results on organizational and cultural barriers offer some implications for practice. On the one hand, public organizations need to buy in support from politicians and top management. Lack of support was found as one of the organizational barriers hindering the change. This suggests that DGT should be part of the political agenda to be successfully pursued. On the other hand, the absence of a relation between DGT and cultural barriers also has practical consequences. Public organizations shall be aware that employees can and will show aversion in changing the *status quo,* but at the same time, DGT at the organizational level was not hindered by cultural barriers. Failures or slowing down of the transformation process cannot be attributed to cultural barriers, instead reasons are found in the absence (or lack of) manager activities that lay a fertile ground towards the transformation. Thus, managers should be aware of their roles and take remedial actions by

creating awareness, a desirability for change, followed by involving employees to determine the transformation needed in the technical and social system.

In conclusion, our analysis offers useful guidelines for practice by looking at DGT at different levels. At the organizational level, our findings show where public organizations shall focus their attention and effort. At the national level, we are offering an overall picture of the current progress in DGT by public organizations and the gaps that are expected to be filled in the near future.

5.3 Limitations and Future Research Direction

We are aware of several limitations of the paper. Moreover, further studies can further explore and build upon the collected evidence. First, the article does not aim at being exhaustive or policy-specific in identifying the list of managerial activities. Second, we limit DGT to a transformation within the organizational boundaries, although DGT involves a larger ecosystem of stakeholders that are part of this transformation process (Luna-Reyes et al., 2014). Third, for testing the results with SEM methodology, the number of constructs must be limited. We focused on cultural barriers and organizational barriers, leaving out other possible barriers. For example, we excluded the effect of internal and external drivers (*xxx details omitted for anonymous reviewers*).

For overcoming those limitations, further studies are needed. The results highlight the role of management. Hence further studies should deepen this analysis, particularly how managers should act in pursuing a transformation process. Finally, the absence of a relation between cultural barriers and DGT deserves further studies to understand this counter-intuitive result.

From a methodological perspective, the SEM methodology does not imply causality among the constructs, thus the underlying relations need to be consolidated with casual evidence and accordingly further and more specific studies.

Finally, the t-government and DGT literature is mainly qualitative (Omar et al., 2020). One of the main contributions of this paper is a quantitative analysis filling this gap. Similar results were found in a previous study carried out in the Netherlands (*xxx details omitted for anonymous reviewers*), suggesting the possibility of generalization. Also, further studies could submit the same questionnaire in other countries for exploring DGT in different national settings.

6 Conclusions

In this paper, we developed a DGT framework consisting of impeding and driving factors and tested this framework using a survey with Italian municipalities. The article is one of the first studies investigating DGT quantitatively. DGT is closely related to t-gov. By using insights from the literature, we define DGT as:

> *'second-order organizational changes enabled by digital technologies transforming the way an organization is 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.'*

Starting from this definition, the paper proposes a DGT framework (reported in Section 2) and adopts a quantitative approach (described in Section 3) for testing it.

Results (Section 4) show that DGT is mainly limited to a transformation of the existing processes and information systems, while the organizational structure, culture, and people's duties and tasks are less affected. Moreover, DGT is influenced by a combination of different managerial factors, including the sense of urgency, the need for change, the definition of a shared vision, and the creation of a collaborative environment. Thus, ensuring the presence of those factors is one of the main duties of a public manager. Looking at the impeding factors,

organizational barriers such as lack of support or coordination hinder the transformation. Finally, cultural barriers were not found as an obstacle for DGT.

References

Al-Emadi, A., & Anouze, A. L. (2018). Grounded Theory Analysis of Successful Implementation of E-Government Projects: Exploring Perceptions of E-Government Authorities. *International Journal of Electronic Government Research (IJEGR)*, *14*(1), 23–52. https://doi.org/10.4018/IJEGR.2018010102

Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin*, *103*(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411

Ashaye, O. R., & Irani, Z. (2019). The role of stakeholders in the effective use of e-government resources in public services. *International Journal of Information Management*, *49*(January), 253–270. https://doi.org/10.1016/j.ijinfomgt.2019.05.016

Borman, M., & Janssen, M. (2013). Reconciling two approaches to critical success factors: The case of shared services in the public sector. *International Journal of Information Management*, *33*(2), 390–400. https://doi.org/DOI 10.1016/j.ijinfomgt.2012.05.012

Bostrom, R. P., & Heinen, J. S. (1977). MIS Problems and Failures: A Socio- Technical Perspective. *MIS Quarterly*, *1*(3), 17–32.

Budding, T., Faber, B., & Gradus, R. (2018). Assessing electronic service delivery in municipalities: determinants and financial consequences of e-government implementation. *Local Government Studies*, *44*(5), 697–718. https://doi.org/10.1080/03003930.2018.1473768

Cavalheiro, G. M. do C., & Joia, L. A. (2016). E-Government Technology Transfer: A Case Study of the Implementation of a European Patent Management System in Brazil. *Public Administration and Development*, *36*(3), 215–231. https://doi.org/10.1002/pad.1753

Cegarra-Navarro, J.-G., Pachon, J. R. C., & Cegarra, J. L. M. (2012). E-government and citizen's engagement with local affairs through e-websites: The case of Spanish municipalities. *International Journal of Information Management*, *32*(5), 469–478.

Cordella, A., & Tempini, N. (2015). E-government and organizational change: Reappraising the role of ICT and bureaucracy in public service delivery. *Government Information Quarterly*, *32*(3), 279–286. https://doi.org/10.1016/j.giq.2015.03.005

Coursey, D., & Norris, D. F. (2008). Models of E-Government: Are They Correct? An Empirical Assessment. *Public Administration Review*, *68*(3), 523–536. https://doi.org/10.1111/j.1540-6210.2008.00888.x

Curtis, S. (2019). Digital transformation—the silver bullet to public service improvement? *Public Money and Management*, *39*(5), 322–324. https://doi.org/10.1080/09540962.2019.1611233

Ebrahim, Z., & Irani, Z. (2005). E-government adoption: architecture and barriers. *Business Process Management Journal*, *11*(5), 589–611.

European Commission. (2020). *eGovernment Benchmark 2020: eGovernment that works for the people*.

Evans, N., & Price, J. (2020). Development of a holistic model for the management of an enterprise's information assets. *International Journal of Information Management*, *54*(April), 102193. https://doi.org/10.1016/j.ijinfomgt.2020.102193

Fernandez, S., & Rainey, H. G. (2006). Managing Successful Organizational Change in the Public Sector: An Agenda for Research and Practice. *Public Adinistration Review*, *66*(2), 1–25.

Fischer, M., Imgrund, F., Janiesch, C., & Winkelmann, A. (2020). Strategy archetypes for

digital transformation: Defining meta objectives using business process management. *Information and Management*, *57*(5). https://doi.org/10.1016/j.im.2019.103262

Fletcher, G., & Griffiths, M. (2020). Digital transformation during a lockdown. *International Journal of Information Management*, *55*(July), 10–12. https://doi.org/10.1016/j.ijinfomgt.2020.102185

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50.

Gong, Y., Yang, J., & Shi, X. (2020). Towards a comprehensive understanding of digital transformation in government: Analysis of flexibility and enterprise architecture. *Government Information Quarterly*, *37*(3), 101487. https://doi.org/10.1016/j.giq.2020.101487

Hair, J. F., Black, W., Babin, B., Anderson, R., & Tatham, R. (2010). *Multivariate data analysis (6th ed.)* (Pearson Prentice Hall (ed.)).

Haneem, F., Kama, N., Taskin, N., Pauleen, D., & Abu Bakar, N. A. (2019). Determinants of master data management adoption by local government organizations: An empirical study. *International Journal of Information Management*, *45*(October 2018), 25–43. https://doi.org/10.1016/j.ijinfomgt.2018.10.007

Hanelt, A., Bohnsack, R., Marz, D., & Antunes Marante, C. (2020). A Systematic Review of the Literature on Digital Transformation: Insights and Implications for Strategy and Organizational Change. *Journal of Management Studies*. https://doi.org/10.1111/joms.12639

Jones, S. (2012). EGovernment document management system: A case analysis of risk and

reward. *International Journal of Information Management*, *32*(4), 396–400. https://doi.org/10.1016/j.ijinfomgt.2012.04.002

Kickert, W. J. M. (2014). Specificity of Change Management in Public Organizations: Conditions for Successful Organizational Change in Dutch Ministerial Departments. *American Review of Public Administration*, *44*(6), 693–717. https://doi.org/10.1177/0275074013483871

Kuipers, B. S., Higgs, M., Kickert, W., Tummers, L., Grandia, J., & Van Der Voet, J. (2014). The management of change in public organisations : A literature review. *Public Administration*, *92*(1), 1–45. https://doi.org/10.1111/padm.12040

Levy, A. (1986). Second-Order Planned Change: Definition and Conceptualization. *Organizational Dynamics*, *15*(I), 5–20.

Luna-Reyes, L. F., Gil-García, J. R., Gil-Garcia, J. R., & Gil-García, J. R. (2014). Digital government transformation and internet portals: The co-evolution of technology, organizations, and institutions. *Government Information Quarterly*, *31*(4), 545–555. https://doi.org/10.1016/j.giq.2014.08.001

Meijer, A. J. (2015). E-governance innovation: Barriers and strategies. *Government Information Quarterly*, *32*(2), 198–206. https://doi.org/10.1016/j.giq.2015.01.001

Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, *36*(4), 1–16. https://doi.org/10.1016/j.giq.2019.06.002

Nograšek, J., & Vintar, M. (2014). E-government and organisational transformation of government: Black box revisited? *Government Information Quarterly*, *31*(1), 108–118. https://doi.org/10.1016/j.giq.2013.07.006

Omar, A., Weerakkody, V., & Daowd, A. (2020). Studying Transformational Government: A review of the existing methodological approaches and future outlook. *Government Information Quarterly*, *37*(2), 101458. https://doi.org/10.1016/j.giq.2020.101458

Omar, A., Weerakkody, V., & Sivarajah, U. (2017a). Developing Criteria for Evaluating a Multi-channel Digitally Enabled Participatory Budgeting Platform. In *9th International Conference on Electronic Participation (ePart 2017)* (pp. 3–11). Springer, Cham. https://doi.org/10.1007/978-3-319-64322-9_1

Omar, A., Weerakkody, V., & Sivarajah, U. (2017b). Digitally enabled service transformation in UK public sector: A case analysis of universal credit. *International Journal of Information Management*, *37*(4), 350–356. https://doi.org/10.1016/j.ijinfomgt.2017.04.001

Pedersen, K. (2018). E-government transformations: challenges and strategies. *Transforming Government: People, Process and Policy*, *12*(1), 84–109. https://doi.org/10.1108/TG-06-2017-0028

Pittaway, J. J., & Montazemi, A. R. (2020). Know-how to lead digital transformation: The case of local governments. *Government Information Quarterly*, *37*(4), 101474. https://doi.org/10.1016/j.giq.2020.101474

Sambamurthy, V., & Zmud, R. W. (2000). Research Commentary: The Organizing Logic for an Enterprise's IT Activities in the Digital Era - A Prognosis of Practice and a Call for Research. *Information Systems Research*, *11*(2), 105–114. https://doi.org/10.1287/isre.11.2.105.11780

Scholl, H. J. (2005). Organizational Transformation Through E-Government: Myth or Reality? In M. A. Wimmer, R. Traunmüller, Å. Grönlund, & K. V Andersen (Eds.), *Electronic Government: Proceedings of the 4th IFIP WG 8.5 International Conference,*

EGOV 2005 (pp. 1–11). http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/11545156_1

Svahn, F., Mathiassen, L., & Lindgren, R. (2017). Embracing Digital Innovation in Incumbent Firms: How Volvo Cars Managed Competing Concerns. *Mis Quarterly*, *41*(1), 239–253.

Tassabehji, R., Hackney, R., & Popovič, A. (2016). Emergent digital era governance: Enacting the role of the 'institutional entrepreneur' in transformational change. *Government Information Quarterly*, *33*(2), 223–236. https://doi.org/10.1016/j.giq.2016.04.003

Tate, M., Bongiovanni, I., Kowalkiewicz, M., & Townson, P. (2018). Managing the "Fuzzy front end" of open digital service innovation in the public sector: A methodology. *International Journal of Information Management*, *39*, 186–198. http://search.ebscohost.com/login.aspx?direct=true&db=lxh&AN=128040838&site=ehost-live

van Veenstra, A. F., Klievink, B., & Janssen, M. (2011). Barriers and impediments to transformational government: insights from literature and practice. *Electronic Government, an International Journal*, *8*(2/3), 226–241. http://www.inderscience.com/search/index.php?action=record&rec_id=39838&prevQuery=&ps=10&m=or

Venkatraman, N. (1994). IT-Enabled Business Transformation: From Automation to Business Scope Redefinition. *Sloan Management Review*, *35*(2), 73–87. https://doi.org/10.1002/qua.560360829

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *Journal of Strategic Information Systems*, *28*(2), 118–144.

https://doi.org/10.1016/j.jsis.2019.01.003

Weerakkody, V., & Dhillon, G. (2008). Moving from E-Government to T-Government: A Study of Process Reengineering Challenges in a UK Local Authority Context. *International Journal of Electronic Government Research*, *4*(4), 1–16. https://doi.org/10.4018/jegr.2008100101

Weerakkody, V., El-Haddadeh, R., Sabol, T., Ghoneim, A., & Dzupka, P. (2012). E-government implementation strategies in developed and transition economies: A comparative study. *International Journal of Information Management*, *32*(1), 66–74. https://doi.org/10.1016/j.ijinfomgt.2011.10.005

Weerakkody, V., El-Haddadeh, R., Sivarajah, U., Omar, A., & Molnar, A. (2019). A case analysis of E-government service delivery through a service chain dimension. *International Journal of Information Management*, *47*(August 2018), 233–238. https://doi.org/10.1016/j.ijinfomgt.2018.11.001

Weerakkody, V., Janssen, M., & Dwivedi, Y. K. (2011). Transformational change and business process reengineering (BPR): Lessons from the British and Dutch public sector. *Government Information Quarterly*, *28*(3), 320–328. https://doi.org/10.1016/j.giq.2010.07.010

Yildiz, M. (2007). E-government research: Reviewing the literature, limitations, and ways forward. *Government Information Quarterly*, *24*(3), 646–665. https://doi.org/10.1016/j.giq.2007.01.002

Appendix A

Questionnaire

1. From an organizational perspective, so far digitalization in your organization transformed: (1- strongly disagree; 5 - strongly agree):

   - [TR1] People (duties, tasks, complexity of work, competences)
   - [TR2] Culture (endorsed values, personal and collective behavior)
   - [TR3] Structure (standardization, centralization/decentralization, hierarchy, external relationships, flexibility)
   - [TR4] Processes (reengineering of the existing processes, process management and control)
   - [TR5]Information Systems (IS) (introduction of new IS, replacing of the existing ones, integration amongst different IS, interoperability, IT infrastructure)

2. In your organization, the organizational transformation process that goes along with digitalization is hindered by: (1- strongly disagree; 5 - strongly agree)

   - [OB1] Lack of political support
   - [OB2] Lack of coordination among the departments/areas of the organization
   - [OB3] Lack of managerial support
   - [CB1] Resistance to change
   - [CB2] Bureaucratic culture
   - [CB3] Fear of innovation

3. In approaching the digitalization process, we effectively: (1- strongly disagree, 5 – strongly agree)

   - [MA1] Provide a flexible plan, open to failures and re-planning and that include one or more prototyping phases for testing the new solution
   - [MA2] Craft and communicating a shared vision of change
   - [MA3] Include in the plan a precise strategy for informing and training all the actors involved in the change process
   - [MA4] Ensure the need for change, convincing organizational members of the desirability for change
   - [MA5] Encourage participation and open discussion
   - [MA6]Identify short-terms (quick-wins) as well as long terms goals, defining for each of them the needed resources and the order of priority

4. Public Administration:
   - Ministry
   - Administrative Organization
   - Regional Administration
   - Municipality
   - Other government
   - Private company
   - Other (specify)

5. Number of employees of the Administration:
   - ≤20
   - 21-100
   - 101-400
   - 401-2000
   - >2000

6. Years of experience in the public sector:
   - Less than 5 years
   - More than 5 years

7. Years of work in the current organization:
   - Less than 2 years
   - More than 2 years

Figure captions

Figure 1. Number of papers published on DGT over the years
Note. Last update: 30th November 2020

Figure 2. DGT framework
Note. MA: Managerial activities; CB: cultural barriers; OB: organizational barriers; TR: transformation

Figure 3. SEM Results

Table 1. Organizational elements (based on Bostrom and Heinen (1977), Nograšek and Vintar (2014))

Element	Description
Process	The set of activities to transform input into output and to manage and control the entire process.
People	Employees' duties and tasks and, therefore, in the competences needed.
Culture	Endorsed values and personal and collective behaviors.
Structure	The organizational structure, i.e. the level of centralization/decentralization of responsibilities, the hierarchical structure, and the degrees of flexibility.
Information system	The technological systems employed for managing the activities, i.e. all the software, hardware, and the integration between them.

Table 2. Demographic characteristics of Respondents

Demographic Trait		Frequency	Percentage
Age	≤35 years	30	6%
	35-55 years	141	29%
	≥55	320	65%
Highest level of education	High school education	202	41%
	Bachelor degree	45	9%
	Master Degree	216	44%
	Professional degree	22	4%
	PhD	3	1%
	Others	3	1%
Field of study	Economics and business	131	27%
	Law	80	16%
	Engineering	64	13%
	Architecture	31	6%
	Social science	37	8%
	Humanities	30	6%
	Computer Science	29	6%
	None	55	11%
	Others	34	7%
Role	Politician	20	4%
	Director	59	12%
	Pubic Manager	285	58%
	Public Servant	110	22%
	Others	16	3%
Years of experience in the public sector	< 5 years	53	11%
	≥5 years	437	89%
Years of work in the current organization	< 2 years	61	12%
	≥2 years	429	87%

Table 3. Respondents organization's characteristics

Organization's characteristics		Frequency	Percentage
Type of Organization	Municipality	460	94%
	Upper-tier government	31	6%
Number of employees	≤ 20	255	52%
	21- 100	155	32%
	101-400	56	11%
	401-2000	19	4%
	≥ 2001	6	1%

Table 4. Skewness and Kurtosis parameters

	Item																	Constructs			
	TR4	TR1	TR2	TR3	TR5	OB1	OB2	OB3	CB1	CB2	CB3	MA4	MA2	MA1	MA3	MA5	MA6	OB	CB	TR	MA
Skewness	-0.306	-0.04	0.136	0.022	-0.577	-0.097	-0.056	-0.189	-0.536	-0.418	-0.137	-0.264	-0.102	0.22	-0.044	0.067	-0.118	-0.17	-0.342	-0.014	-0.128
Kurtosis	-0.601	-0.696	-0.566	-0.578	-0.351	-1.005	-1.093	-0.996	-0.795	-0.845	-1.159	-0.17	-0.387	-0.548	-0.693	-0.803	-0.72	-0.445	-0.732	-0.218	-0.225

Table 5. Measurement model statistics, reliability, and convergent validity

Construct	Item	Mean	Std. Dev.	Loading	CR	AVE	CA
Cultural Barriers (CB)	CB1	3.56	1.29	.875***	.855	.664	.852
	CB2	3.49	1.24	.724***			
	CB3	3.16	1.34	.819***			
Organizational Barriers (SB)	OB1	3.13	1.27	.635***	.746	.495	.742
	OB2	3.01	1.30	.687***			
	OB3	3.19	1.28	.693***			
Managerial activities (OA)	MA1	2.76	1.12	.744***	.879	.548	.883
	MA2	3.22	1.03	.693***			
	MA3	3.06	1.11	.798***			
	MA4	3.40	0.98	.646***			
	MA5	3.08	1.13	.756***			
	MA6	2.94	1.14	.794***			
Transformation (TR)	TR1	2.99	1.12	.759***	.843	.519	.853
	TR2	2.81	1.09	.752***			
	TR3	2.91	1.10	.796***			
	TR4	3.39	1.12	.727***			
	TR5	3.63	1.12	.716***			

**** Denotes values significant at 99 % confidence level.*

Note. The unique value slightly below the threshold is the AVE for SB, however, the closeness of the value to the threshold (0,5) and the goodness of all the other indicators brought us to prefer keeping all the three items, instead of having a construct with two items.

Table 6. Discriminant validity

	OB	SB	MA	TR
OB	.723			
SB	-.015	.808		
MA	-.166	.613	.674	
TR	.588	.030	-.093	.737

Table 7. SEM Results

Hypotheses	Path	Standardized Estimate	p-value	Supported
H1	OB → TR	-.148	.044	YES
H2	CB → TR	.060	.387	NO
H3a	MA→OB	-.113	.043	YES
H3b	MA→CB	-.008	.872	NO
H4	MA→TR	.573	.000	YES
H5a	DIM→DGT	-.004	.925	NO
H5b	DIM→OB	.193	.000	YES
H5c	DIM→CB	.295	.000	YES

Table 8. Results overview

		Expected effect	Confirmed	Main result(s)	Relevant related literature
Independent variable	DGT	-	-	• digital technologies affect the technical system • the social system is still less affected	Curtis, 2019; Mergel et al., 2019; Pittaway & Montazemi, 2020
Dependent variable	Organizational Barriers	Negative	Yes	• organizational barriers hinder DGT	Ashaye & Irani, 2019; Weerakkody et al., 2019
	Cultural Barriers	Negative	No	• cultural barriers do not affect DGT	van Veenstra, Klievink, et al., 2011; Al-Emadi & Anouze, 2018; Ashaye & Irani, 2019; Weerakkody et al., 2019
	Managerial activities	Positive on DGT	Yes	• Managers drive DGT • Managerial activities tear down or diminish organizational barriers, while no effect on the cultural ones	Fernandez & Rainey, 2006; Tassabehji et al., 2016; Mergel et al., 2019
		Negative on organizational barriers	Yes		
		Negative on cultural barriers	No		