

How smart can government be?

HOW SMART CAN GOVERNMENT BE? – DISCUSSING THE BARRIERS TO SMART
GOVERNMENT ADOPTION

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Smart information technologies are currently finding their way to government. As the range of available objective information technology increases, the gap to practically enacted technology widens. In order to benefit from the full potential smart government could deliver, public managers need to know the barriers that prevent objective technologies to be enacted. This study analyzes these barriers based on 35 interviews with Swiss practitioners with different roles: public managers, ICT specialists, consultants, etc. We find that there are two levels of barriers: (1) basic requirements and (2) higher-order requirements. We distinguish between organizational and institutional barriers that need to be addressed in different ways. While organizational barriers can be addressed by public managers directly, institutional barriers are subject to political initiatives.

INTRODUCTION

Digitization is essential for the modernization of the public sector. New technologies create potential to a wide variety of new applications, ranging from new information and communication channels to new modes of citizens' participation in the political process. However, when these objective information technology meets local organizational and institutional conditions (Fountain 2001), significant barriers hinder a widespread enactment of technical features in public administration. Many of these barriers are known from previous research on electronic government (abbr. e-government). Studies suggest that barriers such as the lack of privacy and security, lack of skills and lack of trust and transparency are the major obstacles for a successful implementation of e-government projects (Savoldelli, Codagnone et al. 2014). As a result, e-government initiatives are increasingly being questioned and a majority of e-government outcomes fell short of expectations (Anthopoulos, Reddick et al. 2016).

In the last years, innovative and promising technologies such as Internet of Things, sensor systems, big data analytics and artificial intelligence have become increasingly important. They marked the beginning of a new wave of digitization not only in the private sector but also in the public sector. They raise new expectations that public-sector organizations will, for example, improve their service quality and cost-effectiveness by using these technologies and related applications as private sector organizations do. In fact, numerous Smart City initiatives recognize the potential of these technologies. Despite their early stage of development, these initiatives promise a new service delivery model for public services: Smart Government. Even more than past electronic government initiatives, smart governments attempt to “use sophisticated information technologies to interconnect and integrate information, processes, institutions, and physical infrastructure to better serve citizens and communities” (Gil-Garcia 2012). Smart Governments pursues this by connecting physical, digital, public, and private environments (Scholl and Scholl 2014, Bhatti, Zall Kusek et al. 2015, Rochet and Correa 2016).

Smart government promises to become a success in modernizing the public sector. However, many of the smart government initiatives are in the planning or pilot testing phase. Since forward-looking technology alone cannot ensure a successful implementation, it is crucial to analyze barriers, which may hinder the adoption of smart government in this critical phase. Numerous barriers experienced in the public sector are known from previous electronic government projects in the public sector. Several public management scholars including, among others, Gilbert, Balestrini and Littleboy (2004), Zakareya and Zahir (2005), and Savoldelli, Codagnone and Misuraca (2014) documented barriers of the past e-government initiatives. These studies show that many e-government initiatives have not reached their full potential due to numerous barriers.

In this paper, we investigate the barriers smart government initiatives face in the

implementation phase. Barriers hinder the use of sophisticated information technologies to better serve citizens and communities. Moreover they have also numerous side effects, ranging from slowing down the modernization of the public sector to producing a lack of transparency together with a lack of trust and empowerment of the citizens (Savoldelli, Codagnone et al. 2014). We will show that barriers, which have hindered the adoption of e-government will also be apparent at the era of smart government. Thus, public managers responsible for the implementation of smart government solutions can learn from existing knowledge about e-government projects. We will include insights from previous e-government studies.

The remainder of this paper is structured as follows. In section 2, we discuss this study's theoretical and conceptual grounding and provide an overview of the literature on e-government barriers. In section 3, we explain our research method, for data collection and data analysis. In section 4, we present our results. We conclude by highlighting our primary contributions and their implications for future research and practice.

SMART GOVERNMENT

Smart government could be described as a new generation of concepts for the application of information technology in the public sector, following what has been called the 'Electronic Government' (e-government) at the turn of the century (Brinton and Snyder 1996). As a child of the nineties (Moon 2002), e-government mainly builds on internet technology (services through websites) that is technically integrated with existing ICT systems in public administration (Zakareya and Zahir 2005). In contrast to e-government, whose major focus lies on government websites and services provided (centrally) through these websites (Zakareya and Zahir 2005), smart government focuses on fractioned and netted smart technologies that collect, connect and analyze data in order to allow for predictive and preventive policies (see table 1).

Technology is a necessary but not sufficient precondition for smart government. The term "Smart Government" has been used early in a very broad way to describe a government that finds clever solutions for complex problems (Kliksberg 2000). "Smart" in this sense is used as a synonym to sharp, clever, or dextrous. Later publications usually refer to new technology of collecting, connecting and analyzing data (IoT, artificial intelligence, etc.), when talking about smart government. Some describe it as "the extensive use of technology by governments" (Mellouli, Luna-Reyes et al. 2014). Others include a focus on service delivery, e.g. "... to better serve citizens and communities" (Gil-Garcia 2012, Guenduez, Mettler et al. 2017). In a later paper, Gil-Garcia and colleagues highlight the important role of innovation in the context of smart government (Gil-Garcia, Helbig et al. 2014). Not least, new forms of knowledge sharing (Binz-Scharf 2003), open government (Kornberger, Meyer et al. 2017) and the analytical use of new data in quality and quantity (Harsh and Ichalkaranje 2015) are highlighted. In an idealistic and somewhat exuberant way, smart government has been defined as a holistic concept of an intelligent public administration with transparent policy decisions and implementation, with an open exchange of information, the participation of all stakeholders, the improvement of public services, the furthering of innovation, sustainability, competition and quality of life (Scholl and Scholl 2014).

Between objective and enacted technology: barriers to adoption

In her seminal book "Building the virtual state", Jane Fountain (2001) develops an analytical framework to understand technology enactment in public administrations. She distinguishes between objective information technology and enacted technology. Objective technology exists "out there" in the environment of public administration, but also "in here" in the existing software and hardware of administrative IT systems. Today, we would include the internet with its unlimited data resources, but most and foremost smart technologies such as the internet of things, artificial intelligence, networked communication, *inter alia*. It offers a nearly unlimited series of potential applications and gives room

for phantasy about the future shape of public administration. It is as if we asked: “What would be possible if mankind was able to use 100 percent of its brain power?” Enacted technology, on the other hand, is the technology that is applied in reality by public administration, and that alone has an impact on the way services are delivered and outcomes are achieved. Fountain describes technology enactment as a process in which objective information technology meets an organization with its specific characteristics (bureaucracy, networks, and other organizational features) that is embedded in the institutional arrangements of the related politico-administrative system. The relevant actors within the organization perceive the objective technologies, interpret their (positive and negative) potential impact based on the existing situation and translate it into reality by adoption and adaptation (Zilber 2006). This paper’s major question “How smart can government be?” is, in fact, asking for barriers to adoption that prevent public administration to enact the full potential of the objectively existing information technology.

There is a long tradition in analyzing the implementation of ICT in the public sector. Numerous studies in the early 2000s found barriers to the adoption of e-government that included a lack of trust (David, Pierre et al. 2004, Gilbert, Balestrini et al. 2004), information quality (David, Pierre et al. 2004), strategy (Wing 2005, Zakareya and Zahir 2005), technology (Wing 2005, Zakareya and Zahir 2005, Schwester 2009), policy (Wing 2005), leadership and management (Schedler and Schmidt 2004, Zakareya and Zahir 2005, Kim 2009, Schwester 2009), accessibility (Becker 2004, Gilbert, Balestrini et al. 2004), and organizational shortcomings (Chen and Gant 2001, Wing 2005, Zakareya and Zahir 2005, Schwester 2009). Savoldelli et al (2014) find intriguing differences in the frequency of citation of e-government adoption barriers in three periods: In the first period (1994-2004), institutional and political barriers covered approximately 50 percent, while management/organizational and technical/economic barriers covered 25 percent each. In the second period (2005-2009), technical/economic barriers gained ground (40 percent) on the cost of institutional/political (35 percent), just to be reduced to 10 percent in the last period (2010-2012), when institutional/political barriers raised to 70 percent of cited studies. In the following, we will use Fountain’s framework to deepen the analysis of barriers to e-government adoption in order to lay the foundation for our own analysis of the “next generation” that follows the e-government.

Institutional barriers. According to Fountain (2001), institutional arrangements form the context of public administration and guide the actors in their everyday behavior. They instruct taken-for-granted expectations of the relevant actors in a field (McPherson and Sauder 2013), which have an impact on the actors within public administration (Delbridge and Edwards 2013). When innovations meet institutions, the matching of predominant experiences with the expectations of the new may be key for the acceptance of the innovation (Hargadon and Douglas 2001). Contemporary studies of e-government adoption found that general concerns over citizen security, privacy and data ownership, combined with a lack of clear e-government policies in the field of public administration, were major institutional barriers (Wing 2005, Zakareya and Zahir 2005, Schwester 2009). However, we need to keep in mind that institutional barriers were not the major focus of research in the early phase of e-government (Savoldelli, Codagnone et al. 2014).

In a newer study, Janssen et al. (2012) found a series of institutional barriers for not publicizing government data that include, inter alia: an unclear trade-off between public values; risk-averse culture (no entrepreneurship); a revenue system based on creating income from data; a conflict of interest between the local organization and the citizens. Zhang et al.’s (2014) literature review confirms that the institutional, cultural, and policy environment of a public administration influence diffusion of e-government. According to Savoldelli et al. (2014), institutional barriers include digital divide; a lack of legal bases; political commitment; political coordination; measurement and evaluation; citizens’ participation; and trust and transparency.

Bureaucracy may be an institutional setting that contradicts with the expectations that smart

government rises. In a Continental European jurisdiction, smart government initiatives require a legal framework that regulates privacy, data access and use, and liability (Geiger and Von Lucke 2012, Janssen, Charalabidis et al. 2012, Conradie and Choenni 2014). Since this strict interpretation of the rule of law is closely linked to a Weberian bureaucracy organization (Kornberger, Meyer et al. 2017), it can be seen as a structural element of the organization (Fountain 2001) and an organizational precondition for the well-functioning of smart government. Kornberger et al. (2017) compare the requirements for ‘open government’ (one form of a smart government) with the conceptual requirements of a Weberian bureaucracy and find that there is a variety of institutional contradictions that could lead to conflicts in practical implementation: “... we juxtapose the decentralizing principles of the crowd, such as transparency, participation, and distributed cognition, with the centralizing principles of bureaucracy, such as secrecy, expert knowledge, written files and rules” (Kornberger, Meyer et al. 2017: 180). As they analyze the City administration of Vienna as a manifestation of Weber’s bureaucracy model, data suggest that Viennese bureaucrats have found ways to circumvent deeply conflicting situations by changing the nature of ‘open government’ to an ‘open government data’ approach. While the former would contradict with the institutional framework of Weberian bureaucracy, and therefore challenge the institutional identity of public administrators in Vienna (Meyer and Hammerschmid 2006), the latter remains on the surface of nice-but-harmless applications such as a mobile toilet information system.

Even if not openly published, data are subject to major concerns of citizens and politicians. Mergel et al. argue: “In public affairs, citizens’ unease with the perceived loss of privacy creates limits on the use of public data for both government operations and public affairs research.” (Mergel, Rethemeyer et al. 2016: 932). In addition, big data challenge public managers as they “... will need the capability to (1) manage and process large accumulations of unstructured, semistructured, and structured data; (2) analyze that data into meaningful insights for public operations; and (3) interpret that data in ways that support evidence-based decision making” (Mergel, Rethemeyer et al. 2016: 934). Gil-Garcia et al. (2014) emphasize that smart government, in contrast to e-government, includes an innovation strategy and point to Savoldelli et al.’s (2014) demand to go beyond the traditional concept of service innovation. Rather, conceptual and systemic innovation shall be introduced – a demand that mirrors developments in the private sector (Bucherer, Eisert et al. 2012).

Not least, German professor of law Wolfgang Hoffmann-Riem (2017) takes a critical stance to behavior control by algorithms. He argues that fundamental principles of the *Rechtsstaat* (constitutionality) are challenged in that smart technologies in general, and notably ‘preemptive computing systems’ that treat human beings as objects of unconscious control, undermine the autonomy of each citizen which forms the foundation of modern democracy. In addition, one day the question will have to be answered who has the legitimacy to write these algorithms: who defines the problem to be solved; sketches the concept of the solution; develops software and programming; whose orders they follow; which objectives they strive for; which precepts and criteria they apply or which selectivity they incorporate.

Organizational barriers. As smart government ideas conquer the politico-administrative system, they not only face existing institutional arrangements, but also organizational forms and features. Fountain (2001) highlights structural (bureaucracy) and social elements (networks) of organizational forms. In our own understanding, management and leadership engagement also influence an organization’s responses to new technology, as well as available skills, resources, and abilities. Zhang et al.’s (2014) findings confirm that government employees affect the diffusion of e-government through their skills, knowledge constructs, and inter-organizational attention networks. In addition, executive power, leaders’ perceptions, and engagement can support or obstruct innovation based on e-government (Yun and Opheim 2010).

Limited access to broadband internet technology or a lack of interoperability have proven to be

existential barriers to e-government (Zhang, Xu et al. 2014). Savoldelli et al. (2014) confirm that these technical and economical barriers have been seen as major obstacles to the adoption of e-government, at least in the first ten to fifteen years since 1994, while managerial and organizational factors such as a lack of project management capabilities, resistance to change or lack of skills has been fairly stable at the 25 percent level over the years until today.

Some argue that a lack of strategy has been an important barrier to e-government adoption (Wing 2005). An e-government strategy should identify and develop the necessary organizational structure, the way public administration shall interact with citizens and business, and develop cost-benefit concepts (Zakareya and Zahir 2005). Lee and Lee (2014) take the same line in that they postulate to take on the citizens' perspective when developing smart city services. Similar to the digital transformation of business models in the private sector, service delivery models in the public sector should allow citizens' needs and benefits to take the center stage. This is, as Conradie and Choenni (2014) argue, especially true for strategies that include releasing open government data, including the disclosure of personal identities when combining different datasets. Consequently, Geiger and von Lucke (2012) demand that a strategic framework be developed to overcome existing strategy deficits in open data policies.

The role of political and administrative leaders in promoting e-government has been highlighted by several studies (Zakareya and Zahir 2005, Schwester 2009, Yun and Opheim 2010, Savoldelli, Codagnone et al. 2014, Zhang, Xu et al. 2014). For example, it has been found that administrative entities that showed higher management activities were faster in the implementation of e-government. Thereby, management activities did not only include ICT projects but also general management issues such as quality management, creation of incentives, project structures, and service orientation (Schedler and Schmidt 2004).

METHOD

Smart government is a new field of study. Evidence for its adoption or its barriers are fragmented. We therefore chose to conduct semi-structured interviews. Semi-structured interviews are appropriate to gain insights into emerging fields (Gill, Stewart et al. 2008). To identify the barriers of Smart Government adoption in Switzerland we conducted 32 telephone interviews. They were done by telephone in order to be more time efficient. The interviews were held in German or in English. Overall duration of the interview was 30 hours. Data collection took place from April to June 2017.

Semi-structured interviews have been proven useful to gain differentiated information (Blasius 1994). Thus, for participant selection we defined six relevant actor categories: public managers, IT departments, providers of IT applications for public administration, politicians, consultants and heads of industrial companies. Actor categories served to guarantee a broad overview of possible barriers in smart government adoption. For every category we then assigned three known experts we contacted for an interview. Each of those experts is involved in smart government initiatives, either strategically or operationally. Once the interview has been completed we asked the participants to name other experts in their field. Based on the recommendations we reached for new participants.

The interview guideline consisted of six topics. We used the following topics for collecting raw data: vision/strategy, infrastructure, possibilities/potentials, requirements for a transformation and limitations. Each topic served as unit of analysis. Given that smart government is new and its implementation a complex task we first wanted to know if relevant actors have a concrete strategy. Conflicting or uncoordinated goals have been found to hinder the adoption of e-government (Gil-Garcia and Pardo 2005). Conversely, one of the various success factors for e-government implementation are clear and realistic goals (Gil-Garcia and Pardo 2005). Therefore we designed this topic to investigate to what extent actors do coordinate their initiatives and who should guide the initiatives, government as a whole (top-down) or individual actors/departments (bottom-up).

The next subject was infrastructure. Insufficient telecommunication infrastructures and their limited capacity was one of the main barriers in an early phase of e-government (Savoldelli, Codagnone et al. 2014). Technical constraints such as lacking platforms or meta standards, which in a broader sense also are a matter of IT-supply, have also been found to hinder the adoption of open data applications in the public sector (Janssen, Charalabidis et al. 2012). Hence we asked about existing IT-infrastructure such as sensors, apps, networks, platforms or data-analysis tools. They were also asked if there were plans to extend this infrastructure and why.

Afterwards, we asked about possible applications of smart technologies in public sector. Especially we were interested in how the interviewees would improve services with the new technologies and possibilities. To do so the interviewees were asked to give some examples of their own projects in progress or completed. Similarly we asked about the potential improvement of outcomes of public interventions. Then they have been told to consider all opportunities Smart Government gives and were then asked: “What are the reasons why your department/public administration has not implemented it yet?”. By asking this questions, interlocutors were encouraged to share their very own thoughts about what hinders the adoption of smart government. Lastly, we wanted them to identify possible limitations of smart government. They were asked if they see subjects or areas of application that need to be constraint or if and what concerns they have regarding smart government. In the end of every interview we asked the participants to name the main barriers from their perspective. All interviews were then transcribed.

Data was analysed in two stages. In a first step of data analysis, we developed a codebook containing possible barriers for smart government adoption. To do so we assessed the literature about barriers in the adoption of innovations in the public sector in general (De Vries, Bekkers et al. 2016), e-government (Savoldelli, Codagnone et al. 2014) and, open data and open government (Janssen, Charalabidis et al. 2012, Conradie and Choenni 2014). We also examined the data from our interviews. We combined insights from the literature and the interviews iteratively. This process of screening revealed the following 17 barriers: legal foundations, technical infrastructure, IT-standards, political benefit, plurality, silo-thinking, Swiss political system, scarce financial resources, effectiveness, discomfort, citizens’ response, skills and know-how, readiness for innovation, risk aversion, long-term thinking, management support and contested benefits.

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Barriers	Operationalization of the barriers <i>Keywords</i>	Frequencies		Unit of analysis	
		Interview <i>present</i>	<i>absent</i>	<i>present</i>	<i>absent</i>
Legal foundations	lacking legal bases strict laws constraints in dealing with data constraining effects of laws	22	10	35	157
Technical infrastructure	insufficient technical infrastructure insufficient IT-infrastructure	20	12	36	156
IT standards	lacking compatibility of IT-infrastructures lacking standardization of information and communication technology	16	16	22	170
Political benefit	lacking political intention, interest or motivation	13	19	20	172
Plurality	plurality of actors democratic system	17	15	29	163
Silo-thinking	lacking willingness for cooperation silo thinking lacking connectedness between relevant actors	20	12	26	166
Swiss political system	federal system inertia of the politico-administrative system autonomy of authorities or political communities	13	19	21	171
Scarce financial resources	high costs shortage of financial resources focus on costs than on benefits	22	10	33	159
Effectiveness	constraints about effectiveness and/or efficiency relationship between costs and benefits	14	18	17	175
Discomfort	emphasized risks fears and concerns insufficient or lacking security	21	11	30	162
Citizens' response	citizens' resonance citizens' acceptance participation of the citizens	12	10	22	170
Skills and know-how	lacking expertise lacking interdisciplinary insufficient understanding lack of specialists	24	8	32	160
Readiness for innovation	resistance to change unwillingness to innovate	20	12	30	162
Risk aversion	insufficient or lacking fault tolerance risk avoidance	13	19	15	177
Long-term thinking	lacking long term orientation lacking general strategy lacking vision	20	12	26	166
Management support	lacking initiative of politico-administrative management lacking support of politico-administrative management	21	11	32	160
Contested benefit	questioned potentials questioned need questioned benefits questioned relevance	10	22	11	181

Table 1. Barriers for smart government adoption and their operationalization.

In a second step of data analysis, we conducted a cluster analysis. Hence the interviews had to be coded in order to gain analysable data. We used the barriers developed in the first step of data analysis. For operationalizing the barriers, we defined keywords that served as decision criteria if it was present or absent. See table 1 for a complete overview of all variables and their operationalization. Their presence in interview data was coded as 1, their absence as 0. Two coders evaluated the data regarding the keywords. Before rating, both coders received a training session where all barriers and their operationalization had been explained. To assess interrater reliability they coded 36 randomly selected units of analysis. Conformity between their ratings ranged between 86.1 and 100 percent. This accordance is sufficient. The remaining 156 units of analysis were randomly assigned to one of each coder.

Then we conducted a variable hierarchical cluster analysis using SPSS to examine whether these variables build conceptual groups. Cluster analysis is a structure-detecting method aiming to build different groups (clusters), where variables (or cases) in the same groups are very similar whereas the groups amongst each other are as dissimilar as possible (Backhaus, Erichson et al. 2011, Mooi and Sarstedt 2011). Cluster analysis is commonly used for classifying different single cases into groups (Backhaus, Erichson et al. 2011, Mooi and Sarstedt 2011). However, according to Blasius (1994) and (Ek, Runefors et al. 2014), clustering variables (and not cases) by means of their similarity is possible.

As clustering method complete linkage was used to analyse data. This algorithm also known as furthest neighbour method, is eligible with binary data and tends to build rather small and homogenous groups (Mooi and Sarstedt 2011), which conforms with the aims of this study. Simple matching was used to represent the similarity between different variables. This measure is well established to analyse binary data for a cluster analysis (Backhaus, Erichson et al. 2011).

To identify cluster number we did not apply any statistical method, as there is no clear procedure for identifying the exact cluster number (Backhaus, Erichson et al. 2011). For this reason it is recommended to explore different solutions and chose the best explainable one (Mooi and Sarstedt 2011). We chose the solution that fits the theoretical assumptions best. Which variables belong to the same cluster is presented in the results section.

RESULTS

Before leading through the results of the cluster analysis we first want to contribute some general observations. During the interviews it became evident that the participants have been talking about technical possibilities in the first place. Their ideas about applications of smart government ranged from smart lightning to a digital signature. For example a senior consultant stated: „There are initiatives to monitor energy and water consumption with sensors and software in order to make energy supply more efficient”. A politician mentioned digital service delivery: “A possible application would be to digitalise the whole relocation process.” (In Switzerland, this is possible only in a few communities. On cantonal or federal levels it is still impossible.) These answers show that if someone is asked about smart government, the innovative potential of big data and to impact public service delivery or real time policy making seems not to be prevalent. In fact only a few interviewees emphasized future innovative potential. “If we had real time data from nursing homes and the treatments they give to their residents we could predict what treatments or care places will be needed. This would improve service delivery and budgeting accuracy” (interview with a city mayor). In sum the interviews show our participants’ understanding of smart government as establishing and using new technologies in the public sector. This illustrates the importance of new technologies in smart government initiatives.

Cluster Analysis

Data analysis revealed six different clusters containing from one to five variables. We display results with a dendrogram. In the following step, we explain the six different clusters and indicate of what they consist and why this variables fit into the same group. Frequencies of the mentioned barriers on interview level as well as on unit of analysis level can be seen in table 2.

Cluster 1: Legal foundations

In cluster one consists of a single variable: legal foundations. Legal foundations as barrier were mentioned in 35 of 192 units of analysis and in 22 of 32 interviews. This cluster addresses problems with either lacking or too strict laws or regulations. Furthermore it contains a more specific topic: the concerns about dealing with data. This indicates that legal foundations for enabling smart government need to be loose and protective at the same time. Legal foundations build their own cluster because they are a vital precondition for smart government initiatives.

Cluster 2: Technical infrastructure

Cluster two also contains only one variable as barrier: technical infrastructure. This barrier was mentioned 36 times in 192 units of analysis have been mentioned in 20 out of 32 interviews. It contains two different aspects: technical infrastructure or the “hardware”, and IT-infrastructure or the “software”. Having both, appropriate hardware and software, are a vital precondition for smart government. Hence this variable builds its own cluster.

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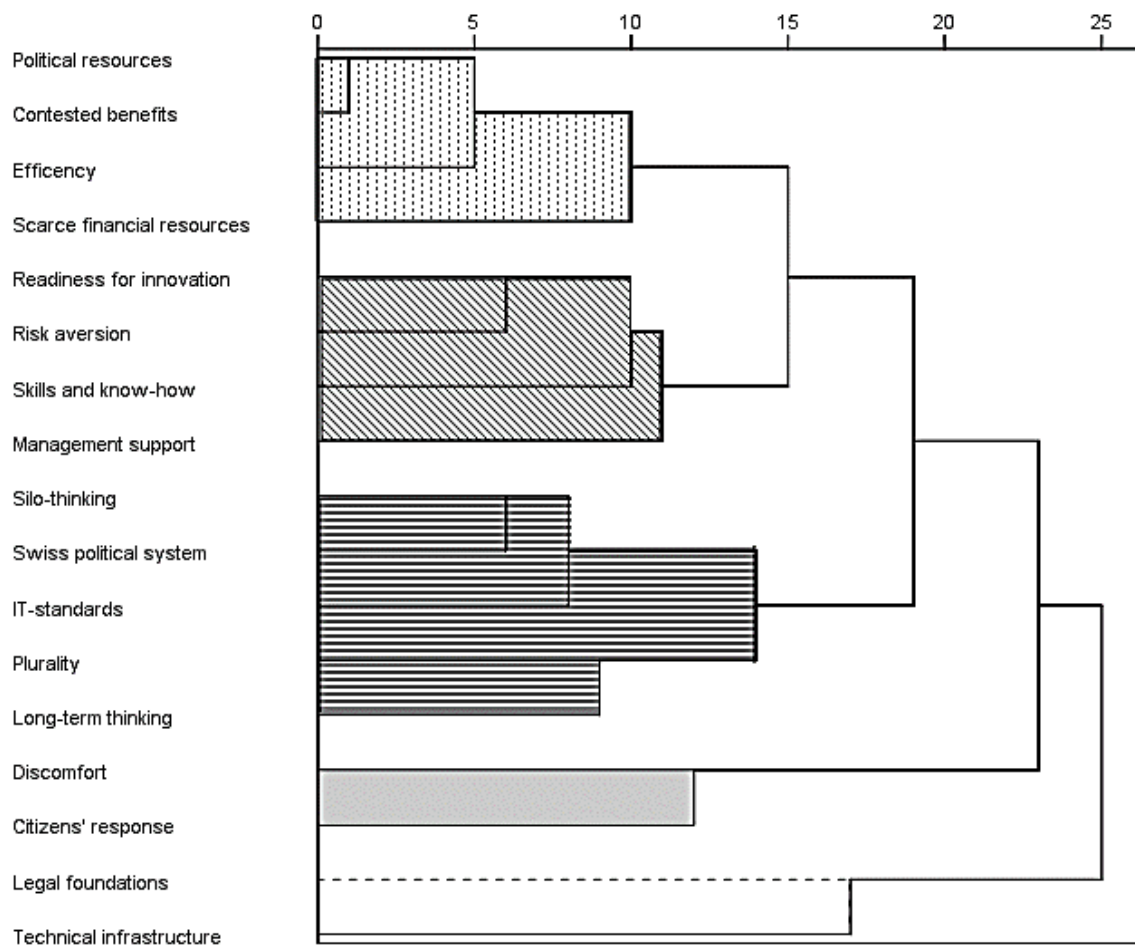


Figure 1. Dendrogram with complete linkage method and simple matching as similarity index showing the six cluster solution.

Cluster 3: Cost and benefit

The third cluster brings together four different variables: political resources (mentioned 20 times), contested benefits (mentioned 11 times), efficiency (mentioned 14 times) and scarce financial resources (mentioned 33 times). In sum variable of this cluster have been mentioned 81 times in the interviews. We name this cluster cost and benefit. All four variables have in common that they address problems in financing smart government initiatives, either because financial resources are scarce or because there is no obvious advantage in implementing smart government (as can be seen in contested benefits and efficiency). This aspects are complemented by limited political resources, suggesting that politicians are not motivated enough or have no clear intention to place smart government on their political agenda.

Cluster 4: Innovativeness

The fourth cluster called innovativeness contains the following variables: readiness for innovation (mentioned 30 times), risk aversion (mentioned 15 times), management support (mentioned 32 times) and skills and knowhow (mentioned 32 times). Together barriers addressing innovativeness have been mentioned 109 times in the interviews. All variables of this cluster describe the problem of bringing innovation into the public administration in general. We therefore call this cluster innovativeness. This group of barriers suggest that public administration is not ready yet for implementing new technologies or processes as it is the case with smart government for two reasons.

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First, public administration at this very moment does not have the necessary technical or managerial skills and know how to bring a reform like smart government through. The variables management support and, skills and knowhow represent this aspect. Second, characteristics of the workplace public administration such as risk aversion and low readiness for innovation hinder implementation of smart government initiatives too.

Cluster 5: Legitimacy

The fifth cluster is called legitimacy and brings together two variables: discomfort (mentioned 30 times) and citizens' response (mentioned 22 times). Both barriers regarding legitimacy have been mentioned 52 times in the interviews. This group shows that not only public administration is not ready for the new developments but that there are various actors that have constraints about smart government. These constraints range from general concerns to security matters to trust (as discomfort was operationalized). In addition according to the interviews citizens do not react to smart government initiatives, show little acceptance for these solutions and are not willing to participate in them, as citizens' response was measured. This cluster indicates that smart government initiatives lack legitimacy.

Cluster 6: Policy coherence

The sixth cluster includes five variables: silo thinking (mentioned 26 times), Swiss political system (mentioned 21 times), plurality (mentioned 29 times), IT-standards (mentioned 22 times) and long-term thinking (mentioned 26 times). In total the variables in this cluster have been mentioned 124 times. The cluster is called policy coherence and contains some Swiss specific barriers in adopting smart government initiatives. Together these variables address issues in collaboration and coordination between and within the three different state levels (in Switzerland: community, canton and federation). These barriers are inherent in the Swiss federal system. Swiss federalism emphasizes the autonomy of cantons and communities (Linder 2010). With every canton having its own legal bases and pursuing its own interests (what refers to plurality) no standardization either in strategy or in technologies occurs. This aspect can be seen in long-term thinking and IT-standards. The plurality of actors and the Swiss federalism also hinders coordination or cooperation between different cantons/communities or even between different departments. That again strengthens what we call silo thinking. With every community and every canton acting independently and emphasizing its own autonomy policies are not coherent.

DISCUSSION

This paper raises one major question: What are the perceived barriers to smart government adoption? As smart government does not have a long history of implementation in Switzerland, we have collected perceptions of relevant actors in the field. A cluster analysis showed that these perceptions can be structured into six different groups: legal foundations, technical infrastructure, cost and benefit, innovativeness, legitimacy and policy coherence.

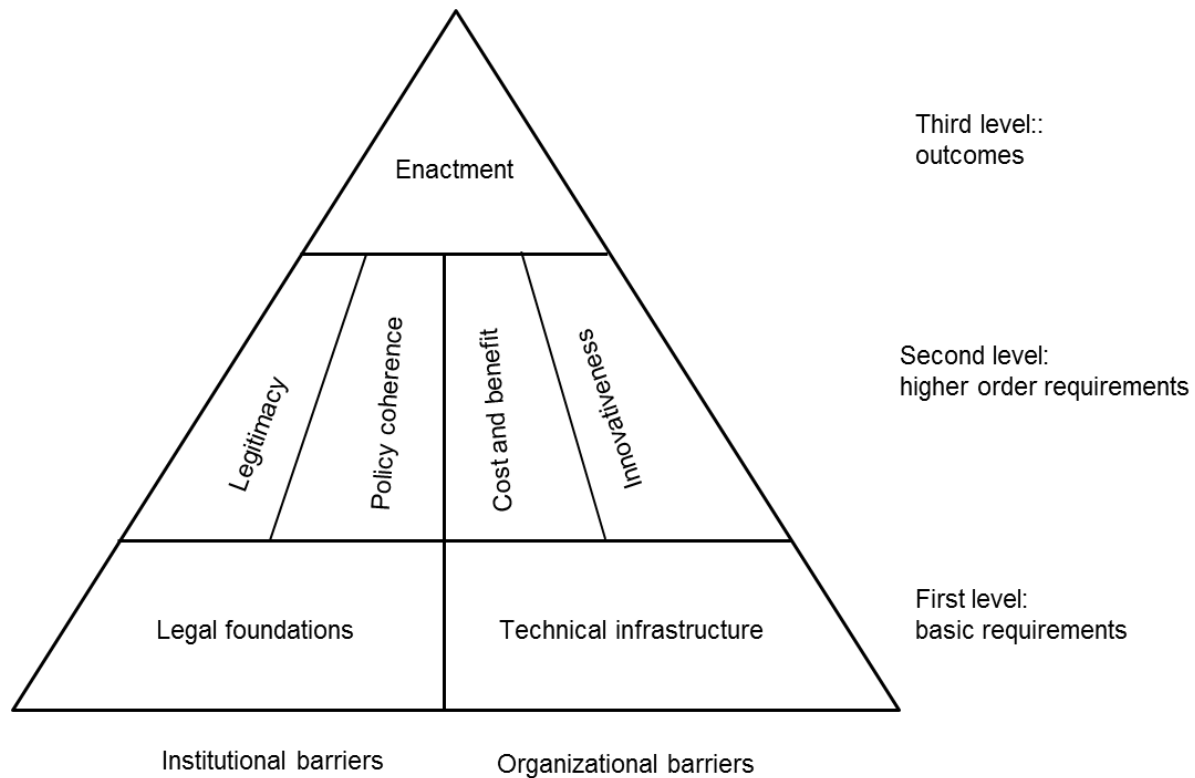


Figure 2. The barriers for smart government adoption and different levels of appearance of this barrier following Fountain (2001).

innovativeness, legitimacy and policy coherence.

Our data suggest that there are two levels of barriers: The first level defines vital preconditions for smart government, with the legal foundations as institutional barriers and technical infrastructure as organizational barriers. Nearly all interviewees have pointed to these preconditions, which demonstrates a high awareness for the technical and legal requirements of smart government. Several studies have shown that technical infrastructure is an important challenge to come by while implementing new technologies into the public sector (Wing 2005, Zakareya and Zahir 2005, Schwester 2009, Savoldelli, Codagnone et al. 2014), especially in early implementation stages (Savoldelli, Codagnone et al. 2014). However, compared to e-government adoption barriers, legal issues are perceived more prominent in the context of smart government (Savoldelli et al. 2014). One explanation for the increased importance of legal barriers is that smart government initiatives require real-time data from citizens whereas e-government focused on the replacement of analogous processes by digital processes. Smart government initiatives raise still unanswered questions about the use of citizens' data ranging from privacy to surveillance (Guenduez, Mettler et al. 2017). This suggests that despite the unresolved problems, relevant actors are aware of the regulatory challenges originating from smart government initiatives.

At the second level, we find institutional and organizational barriers again. Both groups are considered as higher order requirements for smart government adoption. They emerge after basic requirements are at least partly satisfied. Institutional barriers of the second level can be grouped into legitimacy (cluster 5) and policy coherence (cluster 6). To implement smart government, it is important

to overcome the existing discomfort and increase legitimacy by the citizens. In comparison, studies on e-government have increasingly found evidence for the relevance of this factor: it accounts for approximately one quarter of all citations in the latest period of e-government (Savoldelli et al. 2014), with an increase from 1.5 percent in the first phase. Guenduez et al. (2017) found that citizens participate actively and passively in smart government arrangements: Actively, by co-producing services and by taking part in decision making, and passively by tolerating that governments collect and analyse their data. This explains the growing importance of the citizen's perspective in the turn from e-government to smart government.

The other group of institutional barriers at the second level addresses the inability of the politico-administrative system to develop a clear strategy for smart government. The reported disorientation is caused by silo-thinking, the Swiss political system, pluralism, a lack of long-term thinking, and an unwillingness to define technical standards for smart government. This is similar to the lack of political commitment and political coordination that was found in the first and second phase of e-government, though with low importance (Savoldelli et al. 2014), and it reminds us of the lamented lack of strategy (Wing 2005). Its high relevance, however, might be a typical Swiss phenomenon since Switzerland has a highly federal and fragmented state structure (Linder 2010) that often exacerbates efforts to harmonize and standardize technologies.

Our data further suggest that organizational barriers of the second level can be divided into two groups: innovativeness (cluster 4) and cost and benefit (cluster 3). Innovativeness has been studied often as a twin of innovation culture, including element such as risk tolerance, action orientation rather than bureaucracy orientation, or balanced autonomy and intrinsic recognition for individuals (Pervaiz 1998). The same factors have been mentioned by our interviewees. Our findings additionally concur with experiences in the context of e-government adoption in that managerial and organizational barriers have been constantly reported through all the periods of implementation, like an ambient noise that is typical of any kind of change and innovation (Savoldelli, Codagnone et al. 2014). As has been shown, innovation climate in the context of e-government may be the result of former managerial efforts (Schedler and Schmidt 2004), the degree of entrepreneurship (Kim 2009, Janssen, Charalabidis et al. 2012), or the clarity of policies (Schwester 2009). It seems that this ambient noise is likely to sough on in smart government projects in the future. Interviewees also report a lack of clarity about the costs and benefits of smart government, be it from a political or economic perspective. Combined with a shortage in financial resources and concerns about efficiency, this leads to decision makers exercising restraint. This corresponds with findings of De Vries et al. (2016) who study innovation in government in a more general sense, as well as with barriers reported for e-government adoption (Zakareya and Zahir 2005). A certain degree of organizational slack (Pervaiz 1998) is conducive for innovation, especially if the expected outcome of a project is rather unclear – which seems to be the perception of about half of our interviewees.

Beyond the institutional and organizational barriers that were mentioned by the interviewees, it is interesting to reflect potential barriers that were not or not relevantly mentioned. When talking about smart government, most interviewees refer to a vague fascination for technical infrastructure (smart light bulbs, smart metering, smart parking), one aspect of smart government that currently dominates the public debate in Switzerland under the heading of “smart city”. The potential to use individual data for predictive and preventive policies does not seem to take up much space in the awareness of practitioners. Hence according to our model relevant actors in Switzerland are mostly concerned with first level organizational barriers. As such, ‘smart’ seems to be positively connoted, which is reminiscent of the hopes and promises of e-government in its first phase (Wing 2005). Nevertheless, some scholars raise serious concerns about privacy, legal issues, and the functioning of a democratic state in a data-driven politico-administrative system (Hoffmann-Riem 2017). Current literature is taking up the challenges and opportunities that arise with big data in government (Conradie and Choenni 2014, Mergel, Rethemeyer et al. 2016), but we still do not know enough about the consequences for public

administration and politics. Thus, in order to embrace the full potential of an impact smart government could have on public administration and policy, future research should develop a nuanced model of smart government that includes a wider range of innovation in different fields. We suggest four elements that we found to be relevant as a result of our research: (1) smart technology and data issues; (2) innovative service delivery models (business models); (3) the use of citizen behaviour insights; and (4) a strict focus on the outcomes, both related to policy objectives and to smart government itself. By combining and interrelating these four elements, new challenges and opportunities might come to light that will be subject to future research and practice in public administration. It is, however, interesting to learn that at the current stage in Switzerland, the relevant practitioners hardly ever mention citizen behaviour insights. In contrast to practices in the UK and the USA, where there are specialized behaviour science groups who develop “nudging” and other strategies to influence citizen behaviour, Swiss governments either have not yet detected the potential of behaviour insights, or they are reluctant to apply them in this politico-administrative system. We suggest that Swiss governments are responding to the perceived lack of legitimacy among citizens for behavioural policies.

The model we suggest offers interesting insights for public managers and public policy makers. Organizational barriers are in the reach of public managers. In other words, they can be addressed by public managers directly and need to become part of their smart government strategy. Public managers should set up some kind of a business plan for smart government projects which include sufficient resources and clarify expected benefits for both the organization, the citizens, and policy makers. In addition, public managers should enable their organization to implement smart government practices by increasing the innovativeness of their organization. This may include trainings to improve the skills of their staff; a strategy for managing change in their organization; strengthening their communication in order to create a leadership momentum; or defining pilot project to allow their organization to learn from first steps in smart government. Institutional barriers typically cannot be overcome by public managers alone. Legitimacy has to be created by increasing trust among citizens, for example, which may include clear rules and regulations or creating transparency over processes and results. Policy coherence, however, is a highly challenging task in a federalist country like Switzerland. Like for e-government, there is a realistic chance that there will never be a national strategy for smart government, which leads to decentralized developments and a high variety of applications. We might interpret this fact as a disadvantage for Swiss smart government. On the other hand, there might as well develop a competition between cantons and cities for the smartest government applications, from which the whole system could benefit. Our data do not allow for any kind of prediction, so we will have to learn from future developments.

The present study is not without limitations. One might argue that our data is based on subjective perceptions of relevant actors rather than on objective facts. However, by asking 32 actors with different professional backgrounds we reach a sufficient range of opinions and perceptions to understand what the main barriers for smart government adoption are. Second, our results account for challenges of smart government in Switzerland only. This becomes evident in the cluster of policy coherence where Swiss specific barriers as the Swiss political system are mentioned. It might be that difficulties with policy coherence is of less importance in countries that are more centralized than Switzerland. But we still assume that the found clusters and barriers can be generalized since they conform to the barriers found in e-government research. What differs from past e-government research is the relative importance of the barriers. We have shown that legal foundations are of far more concern in smart government initiatives than they have been in e-government initiatives.

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