Development Paths Towards Open Government – An Empirical Analysis Among Heritage Institutions

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Abstract

In the face of the growing digitization of society, a series of transformations are taking place in the public sector that have been described as the second generation of e-government development. The present article traces how these transformations have been anticipated by successive generations of e-government maturity models and critically assesses existing stage models. Based on a survey among 1560 heritage institutions in 11 countries, an empirically validated maturity model for the implementation of open government is presented. The model uses innovation diffusion theory as a theoretical backdrop. While the model is at odds with the unidimensional nature of the Lee & Kwak Open Government Maturity Model (Lee & Kwak, 2012), the findings suggest that the transformative processes predicted by various e-government maturity models are well at work. They result in increasingly integrated services, participative approaches and an emerging collaborative culture, accompanied by a break-up of proprietary data silos and their replacement by a commonly shared data infrastructure, allowing data to be freely shared, inter-linked and re-used. In order to put our findings into perspective, we take stock of earlier discussions and criticisms of e-government maturity models and offer a new take on the issue of stages-of-growth models in the field of e-government. The proposed approach rests on the assumption of an evolutionary model that is empirically grounded and allows for varying development paths.

Keywords: heritage institution, maturity model, cultural heritage, open government, open data, crowdsourcing, innovation diffusion

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Development Paths Towards Open Government – An Empirical Analysis

1. Introduction

In the face of the growing digitization of society, a series of transformations are taking place in the public sector that have been described as the second generation of e-government development (Misuraca, 2009): Interactions between government agencies, citizens, and companies are increasingly becoming data-driven, with cross-organizational data integration being a prerequisite for the creation of integrated service delivery and policy enforcement programs (Fountain, 2004; Bekkers, 2013). Institutional hierarchies are being replaced by network modes of interaction, giving way to new forms of participatory approaches and an emerging collaborative culture mediated by the Internet. Public sector organizations participate in this development either by directly involving citizens as co-producers in their service delivery processes or by tapping into self-organized online communities, in which valuable information, knowledge, contacts or experiences are produced, shared and exchanged (Benkler, 2004; Estermann, Riedl, & Neuroni, 2009; Bekkers, 2013; Strokosch, 2013). The increased data exchange, the blurring of organizational boundaries, and the use of participative approaches have led to the rise of new concepts, such as "open data" and "open government", which stress the free sharing and re-use of data across organizational boundaries, government transparency, and the increased involvement of citizens in the dealings of public administration, and call for new forms of governance (Estermann et al, 2009; Chun, Shulman, Sandoval, & Hovy, 2010).

1.1. Research gaps addressed by the present paper

The present paper addresses two notable research gaps: It traces how the second generation of e-government development has been anticipated by successive generations of e-government

maturity models and puts two recent models, the Open Government Maturity Model (Lee & Kwak, 2012) and Tim Berners-Lee's five-star model of open data development (Berners-Lee, 2006-2009), to an empirical test. In order to put our findings into perspective, we take stock of earlier discussions and criticisms of e-government maturity models, which have been a recurrent topic in the *Government Information Quarterly* (cf. Layne & Lee, 2001; Andersen & Henriksen, 2006; Gil-Garcia & Martinez-Moyano, 2007; Yildiz, 2007; Gottschalk, 2009; Klievink & Janssen, 2009; Lee, 2010; Andersen, Medaglia, Vatrapu, Henriksen, & Gauld, 2011; Concha, Astudillo, Porrua, & Pimenta, 2012; Lee & Kwak, 2012; Maheshwari & Janssen, 2013; Veljković, Bogdanović-Dinić, & Stoimenov, 2014), and offer a new take on the issue of growth models.

Furthermore, the paper gives an account how the transformations described above materialize in the cultural heritage sector, a sector adjacent to classical public administration which has not received much focus in the e-government literature so far. Based on a survey among 1560 heritage institutions in 11 countries, an empirically validated maturity model for the implementation of open government in the heritage sector is presented, which provides an answer to the two key research questions covered by the paper, namely: Is there a typical path heritage institutions follow when adopting Internet-related practices? And if so, to what extent do the data provide evidence for the validity of the Lee & Kwak Open Government Maturity Model and Tim Berners-Lee's 5-star model of open data maturity?

1.2. Specifics of the cultural heritage sector

The cultural heritage sector is made up of institutions such as museums, libraries, archives and records offices, and other organizations with curatorial care of a heritage collection (Nauta, Bakker, & de Niet, 2011). While some heritage institutions are governed by public law, many others are constituted as private non-profit organizations, a large fraction of which are mainly publicly funded and thus directly affected by public funding policies. While

heritage institutions have received little attention so far in the e-government literature, we would expect them to be particularly prone to embrace the transformations described above, due to several factors:

- First, the heritage sector has traditionally been composed of both private, public, and hybrid institutions (Hammack, 1989; Schuster, 1998; Johnson & Thomas, 1998); a certain permeability between the public and private sectors and cross-sector cooperation between institutions with very similar missions therefore appear quite natural.
- Second, many heritage institutions have a long-standing history of relying on volunteer work (Johnson & Thomas, 1998), a form of citizen participation that precedes the more recent calls for increased citizen participation through online channels.
- And third, the Wikimedia/Wikipedia community, one of the largest collaborative online communities, has a decade-long track record of actively engaging and cooperating with heritage institutions (cf. Oomen & Aroyo, 2011). As a result, there are plenty of opportunities for heritage institutions to open up their collections, to engage with online volunteers, and to foster online collaboration around their holdings.

Like classical public administration, the cultural heritage sector has undergone important changes since the advent of the World Wide Web that have manifested themselves in form of successive and sometimes overlapping trends (Estermann, 2014): Since the break of the millennium, digitization of heritage objects and their metadata has been defined as a strategic goal on national and international levels (as exemplified in Europe by the Lund Action Plan for Digitization), leading to increased cooperation and coordination among heritage institutions in order to provide a single-point-of-access to common catalogues, to create

virtual libraries, or to coordinate digitization efforts and long-term archiving. As a result, digitization not only played a role in preserving cultural heritage, but also greatly enhanced access to collections for wider audiences. Half a decade later, heritage institutions started to embrace the use of web 2.0 tools, such as Facebook or Twitter, to get their message out to their publics, and to engage them in conversations. In some cases, institutions even engaged their users/visitors in collaborative production processes, either by launching their own crowdsourcing applications or by cooperating with existing online communities, such as Wikipedia. Early examples of such activities among heritage institutions date back to 2006 with predecessors among non-profit endeavors, such as the "Distributed Proofreaders" project that supports the development of e-texts for Project Gutenberg and was formed in 2000 (Holley 2010). Further trends include the adoption of open data policies and the integration of data across institutional borders thanks to linked data technology. There have been a few attempts to put these different trends into perspective (e.g. Evans, 2007; Oomen & Aroyo, 2011), and some of the new emerging practices have been subsumed under the term "OpenGLAM" – the equivalent of "open government", applied to the cultural heritage sector (the acronym "GLAM" stands for *galleries, libraries, archives, and museums*) (OKFN, 2013).

2. E-Government Maturity Models

There is no universally accepted definition of the concept of e-government (Yildiz, 2007; Concha, Astudillo, Porrua, & Pimenta, 2012), and as the authors of the ninth edition of the UN E-Government Survey note, the concept has greatly evolved over time to include new insights gathered and reflections made throughout the implementation process (UN, 2016, p. 143). Following UN & ASPA (2001), e-government can be defined as "utilizing the Internet and the World-Wide-Web for delivering government information and services to citizens". Other definitions underline the role of ICT in supporting public sector reform and in improving the quality and efficiency of public services, or point to the organizational change

e-government brings about (Grant & Chau 2005; Grönlund 2010; Concha et al., 2012; UN, 2016).

2.1. Mapping the first generation of e-government development

A tool that has been widely used for sense-making and leading change in the field of e-government are maturity models or "stage models", the most cited one being the Layne & Lee (2001) model which describes four stages on the way to "fully functional e-government". All in all, around 20 e-government stage models were published between 2000 and 2012, out of which all but one focus on the first generation of e-government development. They are similarly structured and consistent with the view that e-government passes through the following cumulative stages (Lee, 2010; Fath-Allah, Cheikhi, Al-Qutaish, & Idri, 2014):

- online presence (characterized by the availability of government information on the Web);
- interactivity (characterized by the possibility of two-way online communication between government and citizens);
- transaction (characterized by the possibility to complete transactions online);
- integration (characterized by cross-agency integration of services – both horizontally and vertically across different levels of government – which typically manifests itself in a nation-wide one-stop shop, or several one-stop shops for different target groups, in seamless services for citizens, and in the integration of back-office systems).

While some of the early empirical research had been dubitative as to the validity of the latter of these stages (Torres, Pina, & Royo, 2005; Bekkers & Homburg, 2007; Coursey & Norris, 2008), empirical studies among US local governments have largely confirmed the first three stages (Moon, 2002; West, 2004; Norris & Reddick, 2013), while the successive editions of

the UN E-Government Survey have documented the progress through the four stages at the level of national governments (UN & ASPA, 2001; UN, 2003-2016).

2.2. Fields of application

The basic idea behind stage models is that descriptive stages can be used in a prescriptive manner, serving as learning models for organizations to help them move from one stage to the next (Klievink & Janssen, 2009). Stage models have a long history in organization and management research (Gottschalk 2009). Their application in the field of information systems has its origins in organizational learning (DeBrí & Bannister 2015). Stage models have been used by change advocates, managers and policymakers for benchmarking and monitoring purposes, to formulate strategic roadmaps, to make public servants aware of future developments, to stimulate the developments of capabilities needed by organizations to migrate from one stage to another, to facilitate joint action and knowledge-sharing among government agencies, to provide milestones to evaluate and control the cost of architecture development, and to identify and disseminate best practices (Janssen & Van Veenstra, 2005; Siau & Long, 2005; Gottschalk, 2009; Klievink & Janssen, 2009; Andersen & Henriksen, 2006; Concha et al., 2012; Fath-Allah et al., 2014). Furthermore, they have been used by researchers to evaluate and understand e-government development and to capture the overall vision of e-government (Siau & Long, 2005).

2.3. Limitations

Traditional stage models assume that stages are sequential in nature, and that they occur within a hierarchical, and often irreversible progression (Klievink & Janssen, 2009). There is some debate in the literature as to whether the stages correspond to predictable patterns in the development of organizations which are marked by discontinuity (ibid.) or whether they rather represent “discrete points in a continuous development process within the organization” (Andersen & Henriksen, 2006). Some empirical studies have concluded that there are no discernable steps or stages in e-government and that governments rather adopt e-government

incrementally (Coursey & Norris, 2008; Norris & Reddick, 2013). This is in line with the observation that in practice, within a given organization at a given point in time, different elements of e-government may be situated in different phases of the stage model (Siau & Long, 2005; Davison, Wagner, & Ma, 2005; Andersen & Henriksen, 2006; Gil-Garcia & Martinez-Moyano, 2007). Furthermore, several authors have pointed to the fact that the development of e-government is not linear and that individual organizations do not necessarily need to go through all the stages sequentially. There may be different reasons for this: later adopters may learn from frontrunners and jump certain stages, some organizations may not have the resources and capabilities needed to reach the highest growth stages, some organizations may lack client groups or types of services that require the higher stages, and some may have different political priorities (Moon, 2002; West, 2004; Davison et al., 2005; Coursey & Norris, 2008; Klievink & Janssen, 2009; Lee, 2010; DeBrí & Bannister, 2015). Thus, although they sometimes pretend to be prescriptive and normative, e-government stage models present a development trend rather than a must-go-path (Siau & Long, 2005; DeBrí & Bannister, 2015), and there may be multiple paths through the stages (Gottschalk 2009).

E-government stage models are meant to focus attention on particularly relevant aspects of e-government. Authors do not necessarily agree on what the most relevant aspects are. Several authors have pointed to what they consider to be the blind spots of earlier models, and some of them have proposed their own model to remedy the situation. Thus, Andersen et al. (2011) argue that while there is a large pool of models focusing on technological and organizational integration from a supply side perspective, the user perspective is lacking. Kalampokis, Tambouris, & Tarabanis (2011) on the other hand consider that traditional e-government stage models, by focusing on service provision, do not sufficiently take into account the aspect of data integration. Similarly, DeBrí & Bannister (2015) contend that, given their outward-facing view of e-government, e-government stage models do not adequately take into account politics or important technologies, such as data analytics, artificial intelligence, or cloud

computing. They also criticize that the models typically lack the multi-dimensional perspective that would be needed to measure value for money in ICT investment. In the same vein, Grönlund (2010) warns that e-government stage models could be detrimental when used as the sole guide by decision-makers, as they avoid complex issues of e-government by neglecting policy challenges with regard to privacy protection, accountability, and other public-sector values.

Further criticism of e-government stage models roughly falls into one of the following categories:

- Stage models lack a theoretical foundation and are often not empirically validated, which is especially true for later development stages the descriptions of which tend to be highly speculative and overly optimistic (Andersen & Henriksen, 2006; Coursey & Norris, 2008; Klievink & Janssen, 2009; Van Veenstra, Klievink, & Janssen, 2009; Maheshwari & Janssen, 2013; DeBrí & Bannister, 2015).
- The way stage models are sometimes applied does not transcend the level of individual organizations and thus misses the role played by inter-organizational collaboration, as some of the functions of later development stages may be realized at the level of network organizations, and not necessarily within individual organizations (Janssen et al., 2008; Klievink & Janssen, 2009).
- There is little or no consideration of change mechanisms, change management and organizational development strategies in the models (Janssen & Van Veenstra, 2005; DeBrì & Bannister, 2015). Stage models typically do not list the capabilities needed by organizations to evolve from one stage to the other and hardly provide any guidance on how to structure the information architecture's maturity process, which makes them less useful for organizations (Davison et al., 2005; Janssen & Van Veenstra, 2005; Klievink & Janssen, 2009; Maheshwari & Janssen, 2013); some

authors have therefore complemented the stage models accordingly (Janssen & Van Veenstra, 2005; Klievink & Janssen, 2009; Kim & Grant, 2010; Chen, Yan, & Mingins, 2011).

- Stages-of-growth models are often based on intuitive, appealing models without providing any guidance to determine in which stage an organization is (Maheshwari & Janssen, 2013).

There is a further strand of criticism related to e-government benchmarking, which is not limited to stage models, but applies to any quantitative evaluation of progress: Are the right variables being measured? And, if several different variables are involved, how do we know that the method for weighing them is correct? – As Bannister (2007) notes, e-government rankings are likely to have a negative impact if the benchmarkers do not have their priorities right. Like rankings, maturity models are employed to focus practitioners' attention and tend to be the driver for national e-government policies and governance structures (Andersen et al., 2011) – if the focus is on the wrong aspects, this has nefarious effects. It is therefore important to critically assess the effects and biases of such instruments and to identify their beneficiaries and blind spots (Bannister, 2007; Andersen et al., 2011). As with other quantitative evaluation approaches, there is a tendency to measure what can easily be measured, while soft factors and socio-technical aspects are neglected (Maheshwari & Janssen, 2013). Thus, e-government stage models that have been devised primarily with quantitative evaluation in mind may focus on what is easily observable (e.g. features of government websites) at the expense of what might be more relevant, but less prone to be observed by outsiders. When assessing stage models used for benchmarking purposes it should also be kept in mind that, according to the study of complex systems, the relevant indicators for e-government advancement are typically not identical with the aspects that should be focused on when trying to make the system evolve in the desired direction (Ninck,

Bürki, Hungerbuehler, & Mühlemann, 2014). – The relationship between good indicators and the system components that should be acted upon to achieve sustainable change is like the one between the symptoms and the root causes of an illness: We may measure the body temperature to judge how ill we are, and we may use medication to reduce the fever, but if we want to actively influence the recovery process, we need to understand the root cause of our illness and the mechanisms leading to the symptoms in order to intervene at that level. In the same way, benchmarking tools may primarily focus on taking the temperature and not on providing guidance as to how to improve the situation in the longer term. This does not automatically make them bad benchmarking tools, as they may perfectly fulfill their purpose. However, those who put the insights from the benchmarks into practice should be aware of the workings of complex systems, lest they waste too much energy on trying to change symptoms instead of acting on factors that provide them with some real leverage to change the system.

2.4. Shedding light on the e-government nirvana

Several e-government stage models do not end with the "integration" stage, but predict some further e-government development or transformation. Criticizing its speculative nature, Coursey & Norris (2008) have dubbed this last stage of e-government development somewhat polemically the "e-government nirvana". Others have pointed out that the development of stage models is never complete, but an ongoing process that is influenced by technological developments (Klievink & Janssen, 2009). Thus, by analyzing the various descriptions of the last stages of e-government development, we may be able to reach a better understanding of what characterizes the second generation of e-government development, which is presently unfolding and has been referred to as "open government". In the remainder of this section, we will therefore provide an overview of the later stages of e-government development as depicted by the first-generation maturity models and by analyzing the discursive shift that has occurred throughout nine editions of the UN E-Government Survey (2001-2016). We will

conclude the section by discussing the Open Government Maturity Model (Lee & Kwak, 2012), which attempts to capture some of the next stage(s) of e-government development and can be thought of as a logical extension of the first-generation models discussed in section 2.1.

While some stage models suggest that e-government culminates in the break-through of governmental silos, in the provision of seamless services irrespective of organizational boundaries (Wescott, 2001), the radical adoption of a user-centered perspective (Deloitte Consulting & Deloitte & Touche, 2000; Baum & Di Maio, 2000; Windley, 2002; Rohleder & Jupp, 2003; West, 2004; Andersen & Henriksen, 2006; Klievink & Janssen, 2009; Lorincz et al., 2009), and/or in the use of online tools to facilitate citizen participation, including e-voting (Hiller & Bélanger, 2001; Wescott, 2001; Moon, 2002; Netchaeva, 2002; West, 2004; Shahkooh, Saghafi, & Abdollahi, 2008; Almazan & Gil-Garcia, 2008; UN, 2012), others go a step further and envision groundbreaking changes:

- Several authors anticipate that e-government will enable new forms of political participation and citizen engagement; they stress its role in empowering civil society and in changing the way people make political decisions (Hiller & Bélanger, 2001; Wescott, 2001; Netchaeva, 2002; Moon, 2002; Siau & Long, 2005; Lee, 2010; UN, 2012).
- While a number of authors stress the importance of data and information sharing between various government agencies (Moon, 2002; Windley, 2002; Alhomod & Shafi, 2012), Andersen & Henriksen (2006) postulate in addition that data sharing will increasingly extend beyond the public sector to also involve private sector companies in the provision of seamless services to citizens. At the same time, they anticipate that data ownership will be transferred to customers and that database infrastructures will be designed to primarily serve end-users.

- According to Andersen & Henriksen (2006), the prevalent division between inside and outside the governmental organization will increasingly be abandoned, leading to enhanced accountability and transparent processes.

One could argue that the less radical vision of e-government development describes the latest instalment of public sector reform or, in other words, the logical conclusion of the New Public Management (NPM) agenda. NPM is an approach to running public sector organizations that was developed during the 1980s in response to some of the shortcomings associated with traditional public administration. As NPM was implemented differently across countries, its exact characteristics vary from country to country, but the main guiding theme is that government works more efficiently if it follows private-sector principles instead of the rules of a rigid hierarchical bureaucracy (Dunleavy & Hood, 1994; Hood, 1995; Pollitt, 1995). This included the disaggregation of large public-sector hierarchies into smaller structures, the introduction of competitive elements through market-like arrangements, and the increased use of pecuniary-based performance incentives for staff, accompanied by a shift in accounting principles and an increased focus on service quality and customer responsiveness (Hood, 1991; Dunleavy & Hood, 1994; Pollitt, 1995; Dunleavy, Margetts, Bastow, & Tinkler, 2006). In this context, e-government can be seen as a means to realize efficiency gains and to reconcile the disaggregation of the public sector with a user-centered perspective by implementing seamless services across governmental silos.

In contrast, the more radical vision of some authors points to something qualitatively new, marking the beginning of the post-managerial era by breaking free from some of the precepts of NPM, such as the reliance on market mechanisms, or the conceptualization of citizens and users as “clients” (cf. Bellamy & Taylor, 1998; Hughes, 2003; Chadwick & May, 2003; Dunleavy et al, 2006; Nam, 2012; Abdelsalam, Reddick, Gamal, & Al-Shaar, 2013).

This shift to a more radical vision of e-government can also be observed in the discourse throughout the different editions of the UN E-Government Survey, where several features of later stages of e-government development become increasingly prominent: Citizens are no longer passive consumers of government-provided information but act increasingly as co-producers of services (UN, 2010). Web 2.0 tools and crowdsourcing approaches empower citizens and allow them to become content creators (UN, 2008; UN, 2014). Open data is expected to enhance public sector efficiency by allowing third parties to provide innovative services (UN, 2010) and to enable effective collaborative governance by better equipping citizens to partake in public decision-making processes (UN, 2012; UN, 2014). In sum, the reports point to a paradigm shift in the role of the public sector, characterized by the concepts of "government as a platform", i.e. as a "provider of data and services for others to exploit as they see fit" (UN, 2010, p. 16), "open government", building on "principles of citizen centricity and information transparency" (UN, 2012, p. 109), and "collaborative governance" (UN, 2014), based on collaboration between government and non-government stakeholders. Governments become catalysts for change instead of mere service providers, facilitate networked co-responsibility by empowering communities to take part in the solution of their own problems, and become entrepreneurial in generating revenues and promoting partnerships (UN, 2014, p. 77).

2.5. Need for a model covering the later stages of e-government development

While there is partial convergence in how different authors envision the later stages of e-government development, one could argue that we have arrived at a point similar to the one almost two decades ago when the first generation of stage models were created: there was a lack of orientation among practitioners as to how to go about implementing e-government (Layne & Lee, 2001). To remedy today's lack of orientation, Lee and Kwak (2012) presented

an integrated "Open Government Maturity Model" that captures these later phases of e-government development. It can be seen as an extension of the earlier stage models.

The model takes its name from the "Open Government Directive" introduced by the Obama administration in 2009, which emphasized three principles of open government: transparency, participation, and collaboration – an initiative that has later been extended to other countries in form of the international "Open Government Partnership" (Lee & Kwak, 2012; Veljković et al., 2014).

Based on the findings from five case studies with US healthcare administration agencies, Lee & Kwak argue that there is a logical sequence for advancing open government, which government agencies should follow in order to harness the power of social media effectively. They posit that the first step in the development towards open government consists in opening up data (**data transparency**), followed by the introduction of participatory elements based on "expressive" social media and web 2.0 tools (**open participation**). At this stage, government agencies *"strive to crowdsource the public's ideas, knowledge, expertise, and experience through voting, polling, contest, blogging, microblogging, ideation, etc."* (Lee & Kwak, 2012, p. 498). The next step consists in fostering **open collaboration** among government agencies, the public, and the private sector. In contrast to open participation, where public engagement occurs in form of relatively simple interactive communications, open collaboration involves public engagement in complex tasks or projects that aim to co-create specific outputs. The last stage in their model is termed **"ubiquitous engagement"** and is characterized by the seamless integration of government data, public engagement methods, social media tools, and government services. This last stage remains however a vision for the future, as none of the open government initiatives examined had reached it.

Veljković et al. (2014) have proposed a benchmarking framework that bears some similarities to the Lee & Kwak model. They suggest operationalizing the notion of "open government"

through concepts such as “open data”, “data transparency”, “government transparency”, “participation”, and “collaboration”. While providing detailed guidance on how to operationalize the first three concepts, they fail to explain how to measure the levels of “participation” and “collaboration”. They also propose a measure for open government maturity, related to the government’s readiness for change and its embracement of open concepts and referred to as “the speed of government progress” (Veljkovic et al., 2014, p. 285), which rests on the somewhat naïve assumption that progress is linear and speed is constant.

Complementary stage models have been proposed that focus on the data perspective and are not necessarily specific to the government sector, such as Tim Berners-Lee’s (2006-2009) 5-star-model for open data maturity, which postulates a gradual development from closed data to open data through to linked open data. The vision of linked data consists in extending the concept of the World Wide Web as a network of decentralized, but interlinked resources to the domain of data. The goal is to create a giant, decentralized database allowing computers to answer queries based on information found on many different websites, the “Web of Data” (Bizer, Heath, & Berners-Lee, 2009; Heath & Bizer, 2011). Kalampokis et al. (2011) propose an “Open Government Data” stage model, which focuses on the aspect of data integration. They remain however unclear as to how their model relates to earlier e-government stage models: While the two earlier stages (**“aggregation”** and **“integration of government data”**) seem to correspond to the “integration stage” of the first generation e-government stage models, the two later stages (**“integration of government data with non-government formal data”** and **“integration of government data with non-government formal and social data”**) are reminiscent of the speculative last stages of some of these models.

Various studies have presented empirical findings regarding the progress that has been made by governments in implementing different aspects of open government, but so far none of the quantitative studies has captured all the aspects present in the Lee & Kwak model:

- Several studies have traced the dissemination of web 2.0 use among governments: Mainka, Hartmann, Stock, and Peters (2014) investigated the social media activities of 31 cities that were expected to be particularly well-equipped for the knowledge economy. They found that 29 of them used at least one of the social media services and that on average, four services were used per city government. The most frequently used service was Twitter, followed by YouTube and Facebook. Analyzing the online presence of 75 EU cities, Bonsón, Torres, Royo, and Flores (2012) found that while most city governments were using social media tools to enhance transparency, the concept of corporate dialog and the use of web 2.0 to promote e-participation were still in their infancy. The authors concluded that social media was simply used as another way to provide information and services to external audiences and that, for the moment, there was no significant revolution in government-to-citizen relationships in sight. These findings are consistent with the findings of several other studies (Brainard & McNutt, 2010; Hand & Ching, 2011; Hsu & Park, 2012; Abdelsalam et al., 2013; Mossberger, Wu, & Crawford, 2013).
- The most notable surveys tracing the progress of open government data on a global scale are the Web Foundation's Open Data Barometer (Web Foundation, 2017) and the Open Knowledge Foundation's Global Open Data Census (Lämmerhirt, Rubinstein, & Montiel, 2017). Both surveys focus on the publication of open government data in a limited number of thematic areas, postulating that a series of standard datasets should exist in every country (Estermann, 2016a). In their 2017 editions, both surveys concluded that only a small fraction of published data was

available as open data. According to the Open Data Barometer, among the 1725 datasets that were assessed from 15 different sectors across 115 countries, only about 7% were fully open (i.e. machine-readable and published under an open license).

Like for classical public administration, the web 2.0 also creates new opportunities for heritage institutions and their communities of interest. It allows them to actively use and reuse cultural heritage content and provides them with opportunities for building cross-institutional collections (Liew, 2014). While some authors point to the great transformative power of social media, leading to a change in the relationship between heritage institutions and their publics towards more interactive and collaborative forms, first empirical evidence suggests that these changes are unfolding rather slowly:

- Based on in-depth analyses over three months' Facebook communication at nine Danish museums, Gronemann, Kristiansen, & Drotner (2015) have found little change in perceived institutional roles. Similarly, Capriotti & Pardo Kuklinski (2012), who analyzed the use of web platforms and social web applications as tools for dialogic communication by 120 museums in Spain, concluded that the way institutions communicate with their audiences has hardly changed. These findings are echoed by the results of a survey among 370 libraries and archives investigating their use of social media: *"there is a large gap between the vision of social media usage by cultural heritage institutions, as reflected in the literature and the reality of actual implementation"* (Liew, Wellington, Oliver, & Perkins, 2015, p. 393). In fact, most heritage institutions were found to use social media as a one-way communication tool, and only about 20% were found to be pursuing participatory objectives, and less than 5% indicated a holistic, transformative vision in connection with their social media use.

- As regards the adoption of open data among heritage institutions, no quantitative studies have been published apart from our own research (Estermann, 2013, 2014, 2015, 2016a, 2016b). There is also still very little research on linked data adoption. Several authors (Yoose & Perkins, 2013; Edelstein et al., 2013; Cagnazzo, 2017) have provided first overviews of existing linked data projects in the heritage sector. They unanimously conclude that linked data adoption is still in its infancy, with many projects merely at a proof-of-concept stage.

3. Method of Data Collection

The analyses presented in this article are based on data gathered by means of an online survey among heritage institutions in eleven countries, carried out between 2014 and 2017. The survey was organized in a federative manner, relying on national teams in the participating countries which were mainly recruited from NGOs promoting open data and free knowledge.

There is an initial sampling bias given the fact that institutions without a publicly available email address have not been contacted. The percentage of institutions thus excluded from the survey ranges between less than 5% (e.g. Switzerland) to around 20% (Brazil). No extra efforts were made to reach these institutions, as the survey would not have made much sense thematically to most of them. Given the fact that no country comparisons are made, this bias is irrelevant in the context of this article. The same goes for the heterogeneity of the heritage sectors in the participating countries and the differences regarding the responding behavior of institutions across countries.

3.1. Survey instrument

The questionnaire contained 34 questions covering the institutions' characteristics as well as their attitudes towards and effective adoption of various Internet-related practices. The questionnaire was elaborated in an iterative process: an initial version was produced based on the questionnaire of a Swiss pilot survey (Estermann, 2013) and the ENUMERATE Core

Survey 2 (Stroeker & Vogels 2014), and complemented by new questions based on a thorough review of previous research regarding open data, crowdsourcing, and social media in the heritage sector (Estermann, 2014). This initial version was reviewed and discussed by a number of scholars and practitioners in the field of cultural heritage as well as by OpenGLAM activists from various countries in an open feedback process that led to a revised version, which in turn was pretested among a small number of institutions. The questionnaire in its various language versions is available for download on the project portal[1].

3.2. Definitions of key concepts

The following definitions were used in the questionnaire:

- **'Metadata'** refers to the data used to describe the heritage objects held by the institutions.
- **'Open data'** refers to data that is made available on the Internet in a machine-readable format to be freely used, modified, and shared by anyone for any purpose.
- **'Linked data'** refers to structured data that is interlinked with data from other data sources based on standard web technologies such as HTTP, RDF, and URIs.
- **'Digitization'** refers to the digital reproduction of heritage objects; in the case of three-dimensional objects, for the purpose of the survey, the term refers to their documentation by digital photography or digitization of older photographs of the objects.
- **'Open content'** refers to making digital copies/images of heritage objects available on the Internet to be freely used, modified, and shared by anyone for any purpose.
- **'Social media'** comprises social media in the broadest sense of the term: social or professional networking sites, microblogging services, video or photo sharing sites,

[1] http://survey.openglam.ch

social bookmarking or cataloguing services, blogs, collaborative online communities, as well as social media functionalities built into institutional websites.

- **'Crowdsourcing'** refers to situations where an institution proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task, that usually would be performed by staff members (Estellés-Arolas & González-Ladrón-de-Guevara, 2012); the term **'collaborative content creation'** was used alternatively to refer to crowdsourcing situations where online collaboration among volunteers is involved.

3.3. Description of the sample

The countries covered are Brazil, Bulgaria, Finland, New Zealand, Poland, Portugal, Spain, Switzerland, The Netherlands, Russia, and Ukraine. The selection represents a convenience sample of countries for which a nearly complete list of heritage institutions and their email addresses could be assembled and for which high quality translations of the questionnaire were provided. Institutions were sent an invitation email and up to two reminder emails. 1560 institutions completed the questionnaire. The overall response rate for the eleven countries was 9.6%, with significant differences among the countries: The highest response rate was achieved in Finland (25.8%), followed by Switzerland (19.5%); the lowest rates were obtained for Spain (5.9%) and Brazil (6.3%).

A large majority of the responding institutions are either public institutions (69%) or private nonprofits (23%). Only 1% are (part of) private, profit-oriented institutions. 7% of respondents indicated that their institution has a mixed form (e.g. premises provided by a public institution; exploitation taken care of by a private nonprofit). 70% of responding institutions are predominantly funded by public funds.

Regarding their size, the sample contains a good mix of institutions: 51% of responding institutions are small organizations with a total annual budget of 100'000 euro or less, while

12% report an annual budget of at least 1 million euro. Similarly, 51% have no more than 5 FTE paid staff, while 20% report at least 25 FTE staff.

Asked about their main users, the surveyed institutions most frequently mentioned private individuals (93%), education (83%), and research (52%). Regarding their geographical reach, 49% of institutions reported that they had a "local/regional" focus, compared to 25% with a "regional/national", 21% with a "national/international", and 6% with a "global" focus.

4. Method of Analysis

The goal of the empirical part of the present article is to shed light on the dissemination of Internet-related practices associated with the latter stages of e-government development in the heritage sector. To do so, an empirically grounded maturity model for the development of Open Government – or more specifically OpenGLAM – is developed. This model is in turn compared to existing theoretical models of Open Government development – mainly the Lee & Kwak Open Government Model as well as Tim Berners-Lee's 5-star model of open data maturity.

4.1. Research questions

The main research questions can thus be summarized as follows:

> **RQ 1:** Is there a typical path heritage institutions follow when adopting Internet-related practices that could serve as a basis for an OpenGLAM Maturity Model?
>
> **RQ 2:** To what extent do the data provide evidence for the validity of the Lee & Kwak Open Government Maturity Model and Tim Berners-Lee's 5-star model of open data maturity?

By positing that e-government typically evolves through a set of stages in a precise order, e-government stage models imply that there is a 'natural' development path that institutions should follow in their evolution towards 'higher' stages of e-government. As stage models are

used to guide institutions' change processes and to evaluate progress, it is important to make sure that the order of stages is empirically valid.

4.2. Operationalization of innovation adoption and diffusion

As has been noted in the literature, stages in e-government development are artificial constructs. In reality, public organizations adopt e-government incrementally, and different units of the same organization may be situated in different phases of the stage model. Also, individual organizations do not necessarily need to go through all the stages sequentially. Taking these observations into account, we translated the hypothetical stages into concrete innovative practices and drew on innovation diffusion theory to operationalize their incremental adoption by individual organizations. Following innovation diffusion theory, the diffusion of an innovation is a social process that unfolds as the members of a social system learn about an innovation and go through the "innovation decision process" (Rogers, 2003). Thereby, *"an individual (or other decision-making unit) passes from first knowledge of an innovation, to the formation of an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision"* (Rogers, 2003, p. 20). The innovation adoption process has been widely described as comprising different, successive stages, although the number of stages, their precise definition, and their naming vary according to the authors. For the purpose of our study, we drew on the model developed by Beal and Bohlen (1957), which *"comprises five distinct stages of innovation adoption from the point of view of an individual organization: At the **awareness stage**, agents become aware of some new idea, but lack details concerning it. At the **interest stage**, they are seeking more information about the idea, and at the **evaluation stage**, they make a mental trial of the idea by applying the information obtained in the previous stage on their own situation. At the **trial stage**, they apply the idea in a small-scale experimental setting, and if they decide afterwards in favor of a large-scale or continuous implementation of the idea, they have reached the **adoption stage**"* (Estermann, 2016a).

	"Adoption"	"Advanced implementation"
Open data	• More than 10% of metadata (average of all metadata types) are available as open data at present, and within the next 5 years over 10 additional percent will be made available as open data.	• More than 50% of metadata (average of all metadata types) and more than 50% of the institution's catalogues, inventories, and finding aids are presently available as open data.
Linked data	• More than 10% of metadata (average of all metadata types) are available as linked data at present, and within the next 5 years over 10 additional percent will be made available as linked data.	• More than 50% of metadata (average of all metadata types) and more than 50% of the institution's catalogues, inventories, and finding aids are presently available as linked data.
Digitization	• More than 10% of content have already been digitized, and within the next 5 years over 5 additional percent will be digitized. OR • More than 5% of content have already been digitized, and within the next 5 years over 10 additional percent will be digitized.	• More than 50% of content have already been digitized.
Open content	• More than 10% of content have already been made available as open content, and within the next 5 years, over 5 additional percent will be made available as open content. OR • More than 5% of content have already been made available as open content, and within the next 5 years, over 10 additional percent will be made available as open content.	• More than 50% of content have already been made available as open content.
Social media	• At least one type of social media is being used at present, and within the next year at least one more will be used. OR • At least two types of social media are being used at present, and within the next year the number of social media types being used remains stable or increases.	• More than 3 (out of 10) different types of social media are being used at present.
Crowdsourcing / collaborative content creation	• At least one type of crowdsourcing or collaborative content creation is being used at present, and within the next year at least one more will be used. OR • At least two types of crowdsourcing or collaborative content creation are being used at present, and within the next year the number of different types being used remains stable or increases.	• More than 2 (out of 5) different types of crowdsourcing or collaborative content creation are being used at present.

Table 1: Criteria used for the "adoption" and the "advanced implementation" stage (Estermann, 2015)

In order to establish the development path followed by heritage institutions when adopting Internet-related practices, we first identified relevant practices based on the existing literature and by consulting both heritage professionals and OpenGLAM activists. The focus was on practices that were expected to be common to all types of heritage institutions (libraries, archives and museums). The questionnaire of our survey was then designed in a way to allow for the responding institutions to be assigned to the different stages of the innovation-decision process as suggested by innovation diffusion theory for each of these practices separately.

Thereby, the following criteria were taken into account (Estermann 2015): By default, institutions were assigned to the "no interest" stage. Institutions which indicated that they require further information, training, or external consulting in a given area were assigned at least to the "interest" stage. Institutions which anticipate a minimal level of activity in a given area (e.g. at least 0.5% of content released as open content over the coming 5 years or at least one social media type used over the coming year) were assigned at least to the "evaluation" stage. Institutions which already reported this minimal level of activity today were assigned at least to the "trial stage". Institutions which reported already quite a high level of activity in a given area were assigned either to the "adoption" or to the "advanced implementation" stage (see table 1 for the criteria that were applied). In addition, institutions which showed stagnating or decreasing levels of activity, were assigned to the "stagnation / discontinuance" stage in order to capture those which are planning to abandon or to significantly reduce a given practice. As this latter group is very small (ranging from 0% to 2.1% depending on the practice), it was excluded from further analyses.

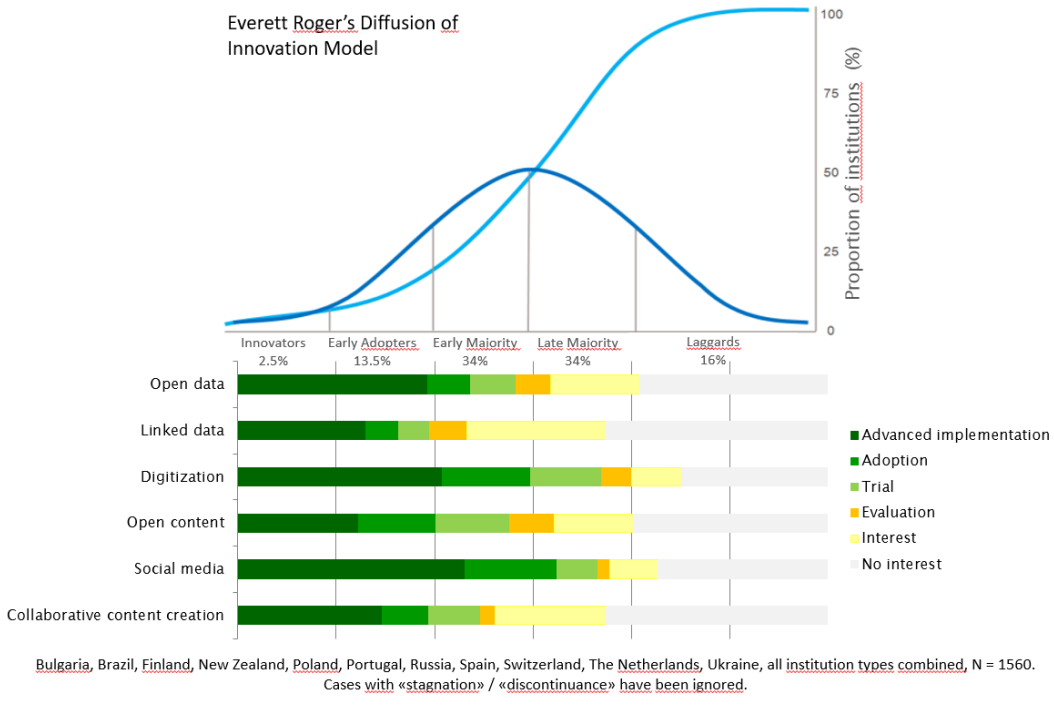


Fig. 1: Diffusion of Internet-related practices among heritage institutions

Figure 1 shows the present state of the diffusion of the various Internet-related practices within the heritage sector. The upper section of the figure features the innovation diffusion model with the different proportions of innovation adopter types (“innovators”, “early adopters”, “early majority”, “later majority”, and “laggards”). It has been established through empirical research in many different fields that the adoption of innovations usually follows a normal distribution curve (Rogers, 2003): At the beginning, only few institutions adopt an innovation and diffusion is slow. Once a critical mass of agents has been reached, the pace of diffusion accelerates until it reaches around half of the agents susceptible to adopt the innovation. After that the pace of diffusion slows down again, and it takes quite a long time until the last institutions join the bandwagon (according to the model, the first 16% and the last 16% of institutions each take as long to adopt a given practice as the two thirds of institutions that adopt the practice in the middle of the diffusion process). This non-linear model of innovation diffusion provides the scale for the lower section of the figure which shows for each Internet-related practice the proportion of institutions that are in the various innovation adoption stages. As can be seen in the graphic, at the time of data collection, the use of social media was the most widespread practice with an adoption rate of 61%, followed by digitization (46%), open data (29%), open content (18%), crowdsourcing or collaborative content creation (14%), and linked data (10%). Note that the speed of innovation diffusion is not necessarily the same for all practices under consideration. Therefore, the order of advancement of the various practices in terms of the innovation diffusion model may differ over time.

While the order of the innovation adoption stages is undisputed, the exact thresholds between the successive stages have been set somewhat arbitrarily based on criteria for which data could be gathered through a quantitative survey. This is also true with regard to the criteria used to distinguish the “adoption” stage and the “advanced implementation” stage (table 1). The assessment is purely quantitative and does not take into account qualitative aspects, such

as the success in using different types of social media (in practice, one well-used social media type is certainly better than two poorly used ones). Also, it does not take into account differences between the institutions with regard to the initial situation (some institutions may mainly have public domain material in their holdings, while others may face considerable copyright-related obstacles when it comes to making digital content available on the Internet). Another qualitative difference that is eclipsed by the model concerns the purpose for which social media is used. As has been noted in the literature, the way social media is used by governments or heritage institutions varies a lot – ranging from one-way communication to more participative approaches. By analyzing the various purposes of social media use by means of principal component analysis, we found the following pattern (the categories are not mutually exclusive): 50% of all institutions use social media to reach out to new users and to improve the visibility of the institution, 27% use social media with the intention to give users a more active role, while 20% of institutions use social media to tap into resources (financial resources or know-how) and to foster networking among institutions and users.

4.3. Identification of the development paths

To tackle our research questions with regard to the development path among heritage institutions when it comes to adopting Internet-related practices, we carried out a multinomial logistic regression analysis (Rodríguez, 2007), using SPSS. To do so, we broke the adoption process for the various practices down into three stages ("no interest / interest"; "evaluation / trial"; and "adoption / advanced implementation") and examined the effect of the various independent variables for each of the two steps. Our final model contained nine independent variables relating to an institution's characteristics, such as the type of institution, the most characteristic types of heritage objects in its holdings, its main users, its geographical reach, the number of employees and volunteers, the composition of revenue sources, the percentage of volunteers in its work force, and the institution's legal form. We also included three independent variables relating to staff skills, such as the number of different ways used to

acquire new skills, the overall satisfaction with the skills level, as well as the institution's perceived effectiveness of skills acquisition.

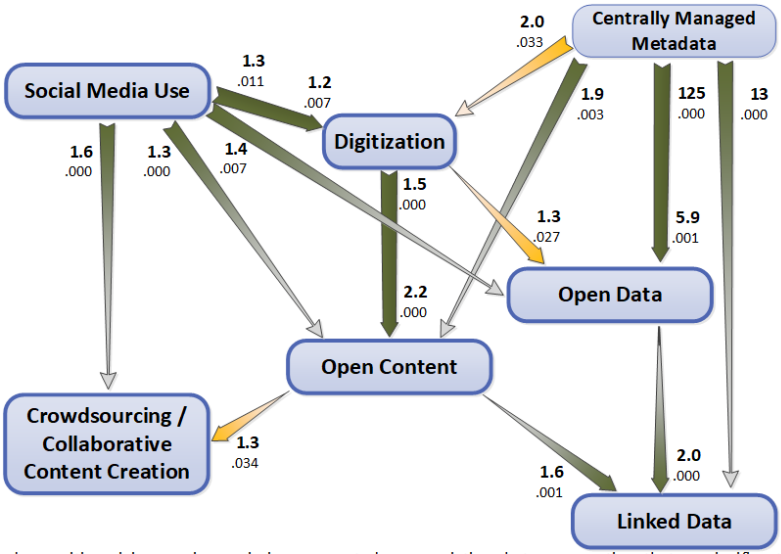
In order to analyze the dependencies between the different practices, the adoption rates of the practices that were more widespread than the practice under consideration were introduced into the model as dependent variables. By this means it is possible to establish to what extent practices tend to constitute a prerequisite in view of the adoption of other, presently less widespread practices. To complement the analysis of interdependencies between various practices, we treated the question whether or not an institution has centrally managed metadata, as an additional practice that was entered as an independent variable into the regression models for all the six other practices.

To control for country differences, we introduced three country-level context factors as further independent variables into our models. After considering several macro-level indicators, we finally settled for the GDP, and the E-Participation Index (EPI), which turned out to be sufficiently independent from each other and promised some explanatory power given the distribution of their values across the countries under consideration. Note that the GDP is strongly correlated with and can therefore serve as a proxy for the ICT Development Index (IDI) and the Human Development Index (HDI). The third context factor introduced in the regression models was the overall effectiveness of skills acquisition by the heritage institutions of a given country, as it appears from the survey data. The choice of this variable is justified by the prominent role of know-how and skills as important factors accelerating the innovation adoption process according to innovation diffusion research (Rogers, 2003). Interestingly, this variable is quite strongly (negatively) correlated with a country's GDP; however, when testing for multicollinearity issues, it turned out that VIF values were relatively small (below 10), indicating that it was acceptable to use both variables in the same regression model.

There were no collinearity issues, and the final models statistically significantly predicted the dependent variables over and above the intercept-only models, with very good results for all models (with p-values below .001). The Nagelkerke pseudo R-square statistics, which gives an indication of the proportion of variance that can be explained by the models, was 0.392 for the "social media use" adoption model (N = 776), 0.356 for "digitization" (N = 767), 0.684 for "open data" (N = 759), 0.371 for "open content" (N = 744), 0.300 for "collaborative content creation" (N = 744), and 0.389 for 'linked data' (N = 740). As missing values were not substituted, the effective sample size varies for each analysis.

5. Results

Figure 2 gives an overview of the results from the multinomial regression analysis. The shape of the arrows indicates whether a correlation holds for the first, the second, or both phases of the adoption process. The exponentiated correlation coefficients indicate the strength of the correlations. Thus, keeping in mind that for the innovation adoption levels a 3-point scale was used ("no interest/interest"; "evaluation/trial"; "adoption/advanced implementation), the graphic can be read as follows:



Results based on multinomial regression analysis; represented are correlations between practices that are significant at 0.01 (green) and at 0.05 (orange). The shape of the arrows indicates whether a correlation holds for the first, the second, or both phases of the adoption process. Exponentiated correlation coefficients are given in bold; the number below them indicates the significance level of the correlation. Correlations with the institutions' characteristics and with context factors are not shown.

Fig. 2: Interrelations between the adoption of various Internet-related practices

- For institutions ranking one step higher on the “social media” adoption scale, the odds of being at the “evaluation/trial” stage instead of the “no interest/interest” stage for “crowdsourcing / collaborative content creation” were 1.6 times higher than for their counterparts ranking one step lower. No significant correlation was however found between social media and the second phase of the innovation adoption process (i.e. moving from “evaluation/trial” to “adoption/advanced implementation). Hence the narrowing arrow in the graphic linking “social media use” to “crowdsourcing / collaborative content creation”.
- For the institutions having centrally managed metadata, the odds of being at the “evaluation/trial” stage instead of the “no interest/interest” stage of “open data” adoption were found to be 125 times higher than for their counterparts without centrally managed metadata. Similarly, their odds of having fully adopted “open data” instead of being at the “evaluation/trial” stage are 5.9 times higher. Hence the broad arrow from the beginning to the end.
- In contrast, ranking a point higher on the “open data” adoption scale does not imply that institutions are more likely to evaluate and try “linked open data”; they are however twice as likely to be among the institutions fully adopting “linked data” than their counterparts which rank a point lower on the “open data” adoption scale. Hence the broadening arrow.

Note that for “centrally managed metadata” a binary variable was used instead of the 3-point adoption scales used for the other practices. The corresponding values therefore tend to be higher and are not directly comparable to the others.

Correlations that are significant at the 0.01 level are represented in green, correlations that are significant only at the 0.05 level are shown in orange. Significance levels are indicated below the exponentiated correlation coefficients. Correlations with the institutions' characteristics and with context factors are not shown in the figure. These factors were however controlled for in the model.

5.1. Typical path when adopting internet-related practices (RQ 1)

It appears from the data that the existence of centrally managed metadata (e.g. in the form of catalogues, inventories, or finding aids) plays an important role with regard to the adoption of "open data" as well as to the initiation of the adoption processes of "digitization", "open content", and "linked data". It is interesting to note that 37% of institutions do not have such centrally managed metadata.

Many dependencies have been identified between the different Internet-related practices. Thus, the adoption of "social media use" tends to precede the adoption of "digitization", even though historically, coordinated efforts to digitize heritage collections preceded the advent of social media. Furthermore, the adoption of "social media use" plays a role with regard to the initiation of the adoption processes of "open data", "open content", and "crowdsourcing / collaborative content creation". "Digitization" rather unsurprisingly appears as a prerequisite of "open content". At the same time, it seems to facilitate full adoption of "open data", which in turn facilitates full adoption of "linked data". And finally, institutions who have adopted "open content" are more likely to also fully adopt "crowdsourcing / collaborative content creation" and "linked data". Given these results, we can conclude that there is not one single typical path heritage institutions follow when adopting the practices under examination, but several inter-connected paths. Note that no significant differences were found between public institutions and private nonprofits when it comes to the adoption of the different practices (profit-oriented

companies were excluded from the analysis as they are rather rare among heritage institutions and represent only 1% of the sample).

5.2. Validity of the Lee & Kwak Model and Tim Berners-Lee's 5-star model (RQ 2)

When putting the various OpenGLAM-related trends into perspective, it appears that the unidimensional nature of the Lee & Kwak "Open Government Implementation Model" is not supported by the data. Most notably, Lee's and Kwak's postulation that the opening up of data should come before the extensive use of social media, does not hold in the face of the empirical evidence – at least not in the heritage sector, where the use of social media was even found to play a role in triggering the adoption of "open data" and "open content". Based on our findings, a more nuanced picture can be painted with heritage institutions following several, inter-connected paths when implementing OpenGLAM-related practices: The first one leads from social media use to crowdsourcing or collaborative content creation. The second one leads from social media use and centrally managed metadata through digitization to open content, while the third path leads from centrally managed metadata through open data to linked data. Implementation of open data appears to be a prerequisite for sustained implementation of linked data, meaning that linked data in the heritage sector is mainly about linked *open* data. The data thus supports the validity of Tim Berners-Lee's five-star model of open data maturity.

6. Discussion

While e-government maturity models have been criticized for various reasons, the validity of the stages identified through a synthesis of the first-generation stage models has been widely established by empirical research. It should however be kept in mind that the models describe a development trend rather than a must-go-path, and that there is no empirical evidence suggesting that the stages correspond to discrete phases in e-government development. On the contrary, e-government adoption is incremental, which is in line with the way innovation

diffusion theory conceives of the innovation adoption process. The first-generation e-government stage models have received a lot of criticism due to the speculative nature of the predicted latter stages of e-government development. However, as we have shown in the present article, taken together, the various models anticipated the actual developments in the field of e-government quite well. This is in particular true with regard to the following aspects:

- Data and information are being shared between various government agencies and processes are designed to cut through organizational silos to provide seamless services to users (Wescott, 2001; Moon, 2002; Windley, 2002; Alhomod & Shafi, 2012): Apart from the creation of integrated library catalogues and access platforms (not covered by the present study), data sharing and integration in the heritage sector is mainly achieved by means of open and linked data.
- Data sharing is extended beyond the public sector, and private sector companies are involved in the provision of seamless services to citizens (Andersen & Henriksen, 2006): While the heritage sector has always been constituted by a mix of public and private institutions, new community-driven services, such as the free online encyclopedia Wikipedia with its online collaborative approach represents a new form of service provision that heavily relies on heritage data from a myriad of institutions.
- Data ownership is transferred to customers (Andersen & Henriksen, 2006): Heritage institutions de facto transfer ownership of digital heritage to the public by respecting the public domain and by releasing some of their content under free licenses.
- A user-centered perspective is adopted (Deloitte Consulting & Deloitte & Touche, 2000; Baum & Di Maio, 2000; Baum & Di Maio, 2000; Windley, 2002; Rohleder & Jupp, 2003; West, 2004; Andersen & Henriksen, 2006; Klievink & Janssen, 2009; Lorincz et al, 2009): Some of the social media use by heritage institutions is indeed

motivated by a strive for a more partner-like relationship to their users. User-centered design is also one of the main drivers behind data integration across institutional silos.

- Citizen participation is being enabled (Hiller & Bélanger, 2001; Wescott, 2001; Moon, 2002; Netchaeva, 2002; West, 2004; Shahkooh et al., 2008; Almazan & Gil-Garcia, 2008; UN, 2012): Crowdsourcing and online collaboration have been integrated into the repertoire of many heritage institutions.
- The prevalent division between inside and outside the governmental organization is being overcome, leading to enhanced accountability and transparent processes (Andersen & Henriksen, 2006): By means of online collaborative projects, heritage institutions increasingly work hand in hand with online communities, thereby involving "outsiders" in processes that traditionally were carried out inside the institution with little public scrutiny.

A couple of trends that have been predicted in some of the e-government development models have not been covered by the study. This is notably true for the aspect of enhanced participation in political decision making (Hiller & Bélanger, 2001; Wescott, 2001; Netchaeva, 2002; Moon, 2002; Siau & Long, 2005; Lee, 2010; UN, 2012). While it could be argued that some of the participatory approaches used in the heritage sector give the public a say in organizational decision-making, this mainly applies to the operative level and would not be considered "public participation" in the sense of Rowe and Frewer's definition as *"the practice of involving members of the public in the agenda-setting, decision-making, and policy-forming activities of organizations/institutions responsible for policy development"* (Rowe & Frewer, 2005). As a matter of fact, one would usually not think of heritage institutions as institutions responsible for policy development, even though a few of them may play an important role in defining what a society's documented memory is supposed to comprise. Similarly, the study has not covered the aspect of data portability regarding

personal data implied by the predictions made by Andersen & Henriksen (2006). Here again, other spheres of the public sector, such as health care, may present more obvious use cases for portable personal data than the heritage sector.

As with the earlier stages of e-government development, there is a strong need to carry out empirical research to establish the validity of the models and to gauge the pace of actual progress with regard to the adoption of innovative practices. Compared to the methods employed by some of the early empirical tests of the first-generation stage models, the theoretical lens provided by innovation diffusion theory is particularly well suited to detect new trends in their early stages (e.g. the adoption of linked data in our case). This is important in order to avoid the false rejection of projections due to early measurement – as exemplified by Norris & Reddick (2013), who overturned some of the conclusions drawn by an earlier, similar study (Coursey & Norris, 2008).

6.1. Usefulness and limitations of stage models

The use of maturity models for sense-making and leading change in the field of e-government has a two-decade-long tradition. While maturity models are no panacea and certainly do not cover all the needs of change management, they are a useful tool to spur reflection within organizations about ongoing transformation processes and to help them shape a changing environment. It is in this vein that we have successfully used the model presented in this article in our own consulting practice. The fact that the model is backed up by quantitative empirical data helps striking a balance between the technical optimism which may arise when extrapolating from the outstanding examples of a few first-mover institutions on one hand, and the overly critical pessimism displayed by some researchers and observers on the other hand. As has been demonstrated by various authors, the value of stage models can be enhanced if they are coupled with reflections on the capabilities needed by organizations to evolve from one stage to the other (Klievink & Janssen, 2009; Kim & Grant, 2010; Chen et

al., 2011) or if they are accompanied by a discussion of their implications regarding business-IT alignment (Davison et al., 2005). Particularly relevant is the observation made by Klievink & Janssen (2009) that organizations may reach certain development stages only through inter-organizational collaboration. While this observation is true for the integration stage of e-government development, it is equally true for the institutions' engagement in online collaborative communities and for their deployment of linked open data. Analyzing this issue by means of atomic business models as suggested by Janssen, Kuk, and Wagenaar (2008) and Estermann et al. (2009) may be particularly useful.

The approach preconized in this paper rests on the assumption that the development model of e-government is evolutionary, and that this evolution is driven by the interplay between technological advancements and evolving social practices. As has been shown for the adoption of social media compared to digitization, certain innovative practices are adopted more quickly than others, which leaves the possibility that certain more recent practices are today more widespread than others that have made their first appearances much earlier. Also, stages-of-growth are not as absolute and clear-cut as some of the earlier e-government maturity models suggest: The deployment of e-government may follow varying development paths for different institutions and for different time frames. By empirically grounding the model based on the theoretical framework of innovation diffusion theory, these variations can be accounted for. When interpreting the data, several caveats apply: Not every phenomenon is easily measurable, and the various measurement methods (e.g. self-reporting versus third party inspection of government websites) have their strengths, weaknesses, and blind spots. Conclusions should therefore not be drawn too hastily, and special care should be applied when using such measurements for public benchmarking.

6.2. Government transformation

Our findings suggest that the transformative processes anticipated by different generations of e-government stage models are well at work within the heritage sector, leading to increasingly integrated services, participative approaches and an emerging collaborative culture, accompanied by a shift in the way data are perceived and managed – a shift characterized by the break-up of proprietary data silos and their replacement by a commonly shared data infrastructure allowing data to be freely shared, inter-linked and re-used. It can thus be concluded that we have well arrived in the post-managerial era, with later stages of e-government development deviating from the NPM agenda in a number of points (cf. Dunleavy et al., 2006):

- There is an increased focus on the role of networks and on collaborative governance in place of the NPM focus on market exchange. While NPM supported contracting out conventional governmental missions to private companies or non-profit organizations, citizen engagement draws on the collective knowledge of the public (Nam, 2012).
- Government is increasingly taking on the role of a platform, providing free access to data and services for others to exploit as they see fit. This idea of providing infrastructure resources under an open access regime is in stark contrast to the NPM call on governments to monetize their services by charging fees.
- Citizens are increasingly seen as prosumers and collaborators instead of customers as was the case under the NPM agenda (Abdelsalam et al, 2013). Together with the increased focus on collaboration between public and private sector organizations, this shift away from the marketization of public services leads to increased permeability of organizational boundaries. When many institutions and private individuals contribute to collaborative projects such as Wikipedia or Wikidata, organizational boundaries are transcended altogether (Estermann et al., 2009).

- As far as the focus is on providing infrastructure resources for the digital society, the distribution of roles between the private and the public sectors is reversed. While the NPM model preconized a public sector that looks for best practices within the business sector, the focus on providing data and data-related services as infrastructure resources brings the public sector back into play due to its traditional role in providing key infrastructures and its focus on creating public value.

As with the implementation of earlier stages of e-government development, these transformative changes will take time. Like the research on earlier phases of e-government development (e.g. West, 2004), our data does not suggest a sudden shift from one paradigm to the other.

6.3. Three development paths of open government

The model derived from our empirical data calls into question the unidimensional nature of the Lee & Kwak Open Government Maturity Model. Instead, open government appears to evolve along three inter-connected development paths. It remains to be seen to what extent these three paths converge in the future as heritage institutions increasingly embrace Wikidata (combining collaborative content creation with linked data) and implement the IIIF[2] standard (applying approaches akin to linked data to the realm of content, cf. Loh, 2017). Similarly, future will tell whether collaborative content creation and linked data will remain associated to open data and open communities, or whether we will see an increased deployment of such approaches behind access controls and within closed communities, as governments, research and heritage institutions increasingly leverage these approaches in the context of sensitive data and copyrighted content.

[2] The International Image Interoperability Framework (IIIF) defines several application programming interfaces that provide a standardized method of describing and delivering images over the web, as well as metadata about structured sequences of images. It ensures the interoperability between content repositories and viewer applications. The standard is presently extended to cover also audio-visual content.

7. Conclusion

By positing that e-government typically evolves through a set of stages in a precise order, e-government stage models imply that there is a ‘natural’ development path institutions should follow in their evolution towards ‘higher’ stages of e-government. As stage models are used to guide institutions’ change processes and to evaluate progress, it is important to make sure that the order of stages is empirically valid. While there is empirical evidence for the earlier stages of e-government development, such as “online presence”, “interactivity”, and “transaction”, little empirical research has been presented with regard to the later stages of e-government development and notably so for the innovations associated with the current public-sector transformation, described as a trend towards “open government”. To close this gap, we have put two existing development models to the test and have attempted to identify the typical path heritage institutions follow when implementing some of the more recent Internet-related practices. In the process, a new stage-of-growth model for e-government has been developed, which is empirically grounded and allows for varying development paths. Unlike earlier models, the proposed model is based on innovation diffusion theory and allows to empirically evaluate new trends at a relatively early stage.

While our model rests on a broad empirical basis and holds for a variety of countries, its validity beyond the heritage sector still needs to be established by similar research in the field of classical public administration and in other areas of public sector activity, such as health care, education, or research. Further research is also needed in order to test predictions with regard to the increased adoption of participative approaches in the field of political decision making, as predicted by some of the first-generation e-government stage models, as this aspect has not been covered by the present study.

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9. Vita

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