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eGovernment in cities of the knowledge society. An empirical investigation of Smart Cities' governmental websites

Kaja J. Fietkiewicz*, Agnes Mainka, Wolfgang G. Stock

Department of Information Science, Heinrich Heine University Düsseldorf, Universitätsstr. 1, D-40225 Düsseldorf, Germany

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ABSTRACT

In view of the increased popularity of eGovernment as an important aspect of the development of Smart or Informational World Cities, we outline three research questions: (1) What is the state of maturity of eGovernments in Informational World Cities? (2) How good (or poor) is their usability? (3) How do they handle boundary documents? In order to clear up these issues empirically, we formulated an extended criteria model for the quantification of eGovernment maturity, analyzed the average quality of the information architecture of 31 identified Informational World Cities' official websites, and studied the processing of boundary documents, i.e. documents that serve different user groups. Our outcomes indicate that the maturity and usability levels of investigated cities are much differentiated, whereas the implementation of boundary documents in form of detailed information sheets is rather scarce. Considering the maturity of investigated eGovernments, there is still potential for improvement, especially regarding the aspects of communication and transaction services. The differences between the eGovernments' usability standards are substantial and the results are partially suboptimal. Our outcomes indicate that the usability levels retrieved from task-based evaluation are not directly linked to integration of boundary documents into the governmental websites.

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1. Introduction

In the research on Smart or Informational Cities, eGovernment and eGovernance are one of the most important aspects to consider (Castells, 1989; Fietkiewicz & Stock, 2015; Linde & Stock, 2011; Mainka, Fietkiewicz et al., 2013; Stock, 2011). In such cities, eGovernance is one of the bases for innovation (Yigitcanlar, 2010) insofar as political programs for developing an information society impact the development of ICT infrastructures and information services. The increased use of ICT and knowledge management between authorities and citizens or businesses optimizes services in eGovernment and call on citizens and companies to actively engage in political debate and decision-making processes (Sharma & Palvia, 2010). "E-government is a generic term for web-based services from agencies of local, state and federal governments" (Sharma & Palvia, 2010, p. 1). The concept of eGovernment includes governmental websites, governmental social media channels, and other digital governmental services. In this article, we focus on governmental websites.

According to Moon (2002), eGovernment includes the interaction levels *information*, *communication*, *transaction*, *integration*, and

participation (Linde & Stock, 2011, p. 106). "Many of the primary e-government functions towards citizens involve the web-based provision of government information and services" (Manoharan & Carrizales, 2011, p. 284). Additionally, governmental websites should serve different user groups (citizens, companies, tourists, etc.) and, therefore, can be regarded as boundary objects (Star & Griesemer, 1989).

The basis of our investigation are Informational World Cities as defined by Mainka, Hartmann, et al. (2013). According to this definition, Informational World Cities are prototypical cities of the knowledge society characterized as knowledge-, creative-, digital-, smart-, and world cities. Our article reports about three information science research studies on eGovernment in prototypical cities of the knowledge society and empirically answers three research questions: (1) What is the state of maturity of eGovernments in such cities? (2) How good (or poor) is their usability? (3) How do they handle boundary documents (i.e., documents serving different user groups)?

There already are some empirical studies on governmental websites at the municipal level (e.g., Norris & Moon, 2005; Scott, 2006), but our study is one of the first quantitative empirical analyses of eGovernment maturity at the city level focusing on the Informational World Cities of the knowledge society.

Considering the latest research by Holzer, Zheng, Manoharan, and Shark (2014), the study's methods mirror their previous research (since 2003) and are complex eGovernment maturity and usability

* Corresponding author at: Heinrich Heine University Düsseldorf, Dept. of Information Science, Universitätsstr. 1, D-40225 Düsseldorf, Germany.

E-mail addresses: Kaja.Fietkiewicz@uni-duesseldorf.de (K.J. Fietkiewicz), Agnes.Mainka@uni-duesseldorf.de (A. Mainka), Stock@phil.hhu.de (W.G. Stock).

analyses of 100 cities. Holzer et al.'s model consist of five components: (1) privacy and security, (2) usability, (3) content, (4) services, and (5) citizen and social engagement. In terms of usability, Holzer et al. focus on formal indicators for a “usable” website. Our approach is more practically oriented, as it examines the websites' usability while typical tasks are being fulfilled. The remaining aspects investigated by Holzer et al.—content, service and citizen participation—partially correspond with our approach. However, we consider some of their applied indicators as not comparable, e.g., within the dimension of citizen participation, such aspects as newsletters or feedback are put together with more sophisticated utilities as synchronous video or chat capabilities. Our model distinguishes between more challenging utilities from the simple ones that are nowadays very common. Therefore, we define the five pillars of eGovernment differing from each other by the level of development and sophistication (which is also reflected in the quantification of these aspects). Some of their investigated cities overlap with municipalities in the focus of our study, therefore, in the course of our results' analysis, we will compare our outcomes with the ones by Holzer et al. (2014). This way we will be able to see to what extent the investigated aspects correlate.

Hence, our results of the municipal eGovernments' maturity may shed light on a new aspect as well as give a new perspective on the development of Informational World Cities. Our comparative usability analysis is consequently based on task-based user tests of the governmental websites' information architectures (for previous research, see e.g. Choudrie & Ghinea, 2005). To our knowledge, our analysis of governmental websites as boundary documents is the first approach in this research area. All our research questions are globally oriented and focus on cities of the knowledge society. In the following, theories on eGovernment will be shortly outlined.

2. Theory

2.1. Models for measuring eGovernment

A number of stage models and indexes has been already developed in order to measure and to compare the eGovernment's advancement (Lee, 2010). One popular eGovernment index has been created by the United Nations' Division for Public Economics and Public Administration: “The Global E-Government Development Index”. It presents the state of development of eGovernment for the UN Member States and is a composite measurement of the ICT infrastructures, education, information, technologies, government internet use, products, services, the level of telecommunication and human capital infrastructure in the respective countries (United Nations, 2012). For this investigation, four stages of online service development were defined: (1) the emerging information services; (2) enhanced information services (one-way or simple two-way communication like downloadable forms); (3) transactional services (like two-way communication, non-financial transaction, filing taxes online), and finally, (4) connected services (citizen-centric, tailor-made services including eServices and eSolutions). Besides the stages of online services, in the investigation, there are included the telecommunication infrastructure (e.g., internet lines) and human capital (e.g., literacy rate or education) index. In contrast, our study focuses on the advancement of the eGovernment in the municipalities disregarding the human capital. We believe that every citizen (no matter of what education) deserves and is able to use advanced eGovernment offerings. We also do not see a direct connection between the education obtained by the citizens and the ability of their government to offer them an appropriate and modern service. As our investigation concerns Informational World Cities (meaning that these cities are equipped with an advanced digital technology), we do not include indicators for digital city infrastructure. Finally, UN-index includes investigation only at a country-level; therefore, a direct comparison with the outcomes of our study is not possible.

Another stage model has been developed by Layne and Lee (2001), who classified the development of eGovernment into four measurable stages: (1) catalogue, (2) transaction, (3) vertical integration, and (4) horizontal integration. The first stage represents the one-way communication between the government and users. Transaction facilitates online transactions with government agencies. Vertical integration refers to local, state and federal governments connected for different functions or services. Horizontal integration is defined as integration across different functions and services (creating the “one-stop-shopping” opportunity for the citizens). Layne and Lee (2001) propose a stage-based growth model for eGovernment suggesting that this is an evolutionary phenomenon. Therefore, it opposes our idea of separate eGovernment pillars as further elaborated in the following paragraph.

Contrary to the four-stage model by Layne and Lee (2001); Hiller and Bélanger (2001) introduced an extended five-stage model. The additional stage is participation (i.e. voting, registration or posting comments online). This could be seen as a sub-set of the stage of two-way communication, but the authors intended to emphasize its importance by using a separate category. Moon (2002) examined the state of municipal eGovernment implementation and assessed its effectiveness. Moon (2002) explored two institutional factors that contribute to the adoption of eGovernment, namely the size and the type of government. He adopted the eGovernment stage model by Hiller and Bélanger (2001) in order to map the eGovernment framework and examine the rhetoric and reality of eGovernment at the municipal level. His study shows that many municipal governments are still at either stage one or two of their development and merely post and disseminate information or provide channels for two-way communication (public service requests).

Coursey and Norris (2008) investigated some of these models to see whether they are accurate or useful in understanding the actual development of eGovernment. The authors' criticism is based on empirical evidence from three surveys of local eGovernment in the United States. Their outcomes show that the local governments were mainly informational, with just a few transactional functions. Therefore, the authors point out that the models proposed by Layne and Lee (2001) as well as Hiller and Bélanger (2001) do not describe the development process of eGovernment accurately, at least not among American local governments. According to Coursey and Norris (2008), these models are purely speculative and have been developed without any link to the literature about government. Finally, Coursey and Norris (2008) argue that there are no recognizable steps or stages in eGovernment. Rather, governments adopt eGovernment slowly and incrementally after an initial eGovernment presence, so that organizational and political factors are likely to significantly affect the development, performance and adoption of eGovernment application.

Following Lee (2010), the eGovernment stage models seem to be incongruent to each other, because they take different perspectives or use different metaphors. He reviewed and analyzed twelve stage models found in the literature between 2000 and 2009. Accordingly, he defined the underpinning perspectives and concepts in order to identify the common frame of reference across the different models. The resulting common frame can be presented as a diagram and includes stages from the citizens/services' perspective (y-axis) and the operation/technology perspective (x-axis); the connecting points of these two perspectives are the government services (presenting, assimilation, reforming, morphing, eGovernance) (Lee, 2010). The stages from citizens' perspective are interaction, transaction, participation and involvement (Lee, 2010). Hence, the model we have chosen for our research is consistent with the common framework for stage models identified by Lee (2010).

The barriers identified by Coursey and Norris (2008) are not as significant for the development of Informational World Cities since such cities either have or aim to build up an advanced ICT infrastructure in the future. Those cities have launched projects to become a *digital city*, *ubiquitous city*, or *smart city* with the goal of better supporting their knowledge society. This implies that Informational World Cities have a

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